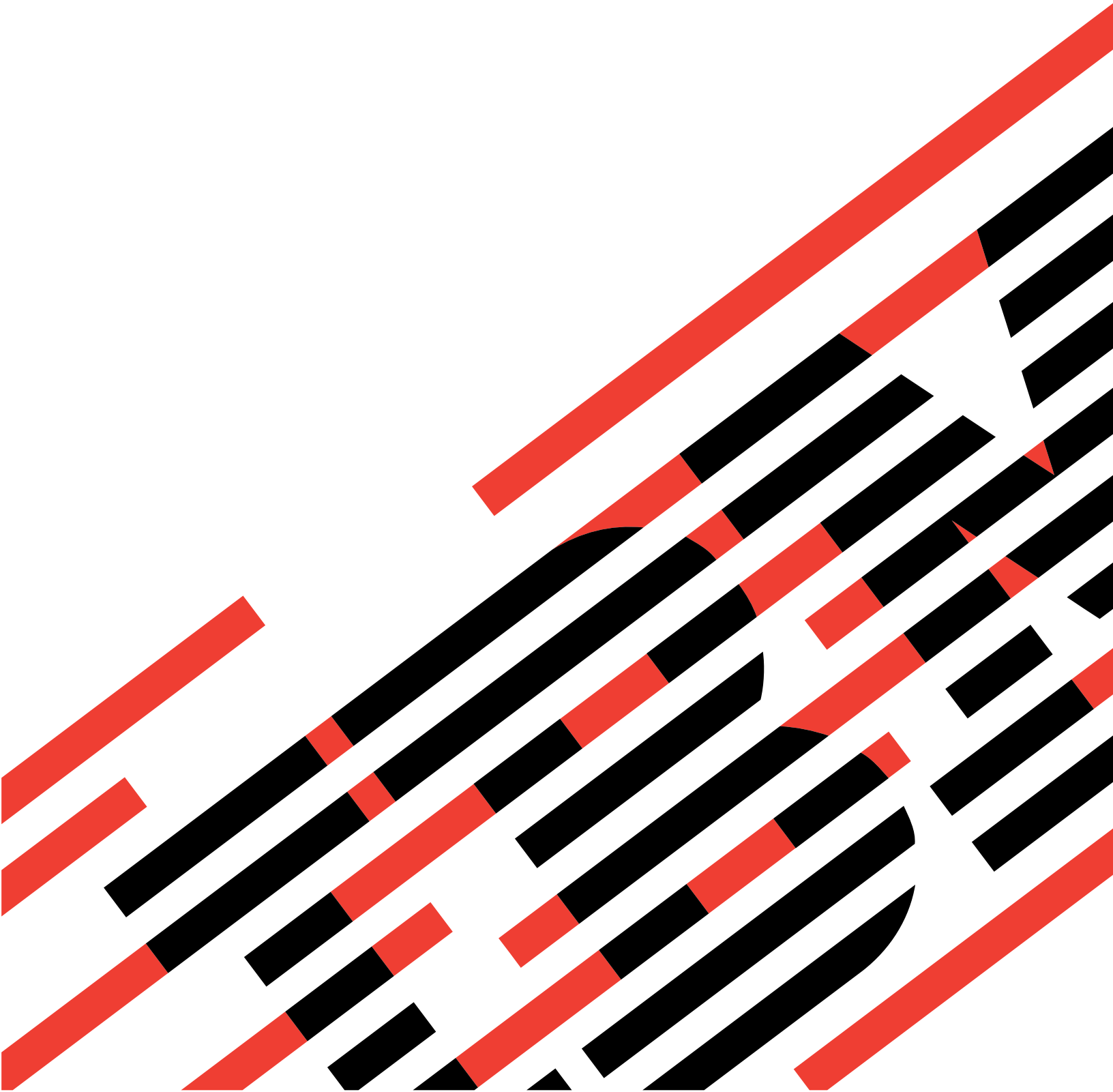
IBM

eserver

xSeries 235 Type 8671

Hardware Maintenance Manual and Troubleshooting Guide



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Note

Before using this information and the product it supports, read Appendix C, “Notices”, on page 205.

Ninth Edition (February 2003)

The most recent version of this document is available at http://www.ibm.com/pc/support.

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About this manual

This manual contains diagnostic information, a Symptom-to-FRU index, service information, error codes, error messages, and configuration information for the IBM® @server™ xSeries™ 235.

Important: The field replaceable unit (FRU) procedures are intended for trained servicers who are familiar with IBM xSeries products. See the parts listing in “System” on page 162 to determine if the component being replaced is a customer replaceable unit (CRU) or a FRU.

Important safety information

Be sure to read all caution and danger statements in this book before performing any of the instructions. See “Safety information” on page 169.

Leia todas as instruções de cuidado e perigo antes de executar qualquer operação.

在安装本产品之前，请仔细阅读 Safety Information
(安全信息)。

安裝本產品之前，請先閱讀「安全資訊」。

Prenez connaissance de toutes les consignes de type Attention et Danger avant de procéder aux opérations décrites par les instructions.

Lesen Sie alle Sicherheitshinweise, bevor Sie eine Anweisung ausführen.

Accertarsi di leggere tutti gli avvisi di attenzione e di pericolo prima di effettuare qualsiasi operazione.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Lea atentamente todas las declaraciones de precaución y peligro ante de llevar a cabo cualquier operación.

WARNING: Handling the cord on this product or cords associated with accessories sold with this product, will expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. ***Wash hands after handling.***

ADVERTENCIA: El contacto con el cable de este producto o con cables de accesorios que se venden junto con este producto, pueden exponerle al plomo, un elemento químico que en el estado de California de los Estados Unidos está considerado como un causante de cancer y de defectos congénitos, además de otros riesgos reproductivos. ***Lávese las manos después de usar el producto.***

Online support

You can download the most current diagnostic, BIOS flash, and device driver files from http://www.ibm.com/pc/support on the World Wide Web.

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Chapter 1. General information

The IBM @server xSeries 235 Type 8671 is a high-performance server. It can be upgraded to a symmetric multiprocessing (SMP) server through a microprocessor upgrade. It is ideally suited for networking environments that require superior microprocessor performance, efficient memory management, flexibility, and large amounts of reliable data storage.

Performance, ease of use, reliability, and expansion capabilities were key considerations in the design of your server. These design features make it possible for you to customize the system hardware to meet your needs today and provide flexible expansion capabilities for the future.

This server contains IBM Enterprise X-Architecture™ technologies, which help increase performance and reliability.

You can obtain up-to-date information about your server and other IBM server products at http://www.ibm.com/eserver/xseries/ on the World Wide Web.

Note: The illustrations in this document might differ slightly from the hardware.

Related publications

This *Hardware Maintenance Manual and Troubleshooting Guide* is provided in Portable Document Format (PDF) on the IBM *xSeries Documentation* CD. It contains information to help you solve the problem yourself or to provide helpful information to a service technician.

In addition to this *Hardware Maintenance Manual and Troubleshooting Guide*, the following xSeries 235 Type 8671 documentation is provided with your server:

- *User's Guide*
  The *User's Guide* provides general information about the server, including information about features, how to configure the server, how to use the *ServerGuide™ Setup and Installation* CD, and how to get help.
- *Installation Guide*
  This printed publication contains setup and installation instructions.
- *Rack Installation Instructions*
  This printed publication contains the instructions to install your server in a rack.
- *Safety Information Book*
  This multilingual publication is provided in PDF on the IBM *xSeries Documentation* CD. It contains translated versions of the caution and danger statements that appear in the documentation for your server. Each caution and danger statement has an assigned number, which you can use to locate the corresponding statement in your native language.
- *Option Installation Guide*
  This publication is provided in PDF on the IBM *xSeries Documentation* CD. It contains instructions to install, remove, and connect optional devices supported by your server.

Depending on your server model, additional publications might be included on the IBM *xSeries Documentation* CD.

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Notices and statements used in this book

The caution and danger statements used in this book also appear in the multilingual *Safety Information* book provided on the IBM *xSeries Documentation* CD. Each caution and danger statement is numbered for easy reference to the corresponding statements in the safety book.

The following types of notices and statements are used in this book:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate possible damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Features and specifications

Table 1 provides a summary of the features and specifications for your server.

Note: You can use the Configuration/Setup Utility program in your server to determine the specific type of microprocessor on your system board.

Table 1. Features and specifications

Microprocessor:
- Intel Xeon, 1.8 GHz or higher depending on server model
- 512 KB (minimum) Level-2 cache
- 400 MHz or 533 MHz front-side bus (FSB), depending on server model
- Support for up to two microprocessors

Note: Use the Configuration/Setup Utility program to determine the specific type of microprocessor on the system board.

Memory:
- Standard: 256 MB or 512 MB, depending on server model, expandable to 6 GB
- Type: 133 MHz/266 MHz registered ECC double data rate SDRAM
- Sizes: 128 MB, 256 MB, 512 MB, or 1 GB, in pairs
- Connectors: two-way interleaved, six dual inline memory module (DIMM) connectors
- Maximum: Three pairs of DIMMs

Drives standard:
- Diskette: 1.44 MB
- CD-ROM: IDE

Expansion bays:
- Six open hot-swap, slim-high, 3.5-inch drive bays
- Three 5.25-inch bays (CD-ROM drive installed in one bay)
- One 3.5-inch removable-media drive bay (diskette drive installed)

PCI expansion slots:
- Two Active™ PCI-X (hot-plug) 133 MHz/64-bit
- Three PCI-X non-hot-plug 100 MHz/64-bit
- One PCI non-hot-plug, 33 MHz/32-bit

Upgradeable microcode:

BIOS, diagnostics, and IBM integrated system management upgrades (when available) can update EEPROMs on the system board

Predictive Failure Analysis® (PFA) alerts:
- Power supplies
- Fans
- Memory
- Hard disk drives
- Microprocessors
- Voltage regulator modules (VRMs)

Integrated functions:
- IBM integrated system management processor (ISMP)
  - Service processor with Light Path Diagnostics™
  - Interconnect port
  - Dedicated I/O port
  - Support for IBM Remote Supervisor Adapter
- Broadcom 5703 10/100/1000 Ethernet controller (one port, controller on system board)
- One serial port
- One parallel port
- Two internal Ultra320 SCSI ports (dual-channel integrated SCSI controller with RAID capabilities on the system board)
- Three Universal Serial Bus (USB) v1.1 ports (one on the front and two on the rear of the enclosure)
- Keyboard port
- Mouse port
- ATI Rage XL video (controller on system board)
  - Compatible with SVGA and VGA
  - 8 MB video memory

Security features:
- Door and side cover lock
- Power-on and administrator passwords
- Remote-control security settings
- Selectable drive startup
- Keyboard password
- System-management security
  - User login password
  - Read-only or read/write access
  - Dial-in call-back

Power supplies:
- Hot-swap (some models)
  - Standard: Two 560 watts (115-230 V ac) for redundancy
  - Redundant/nonredundant indicator on diagnostic LED panel
- Non-hot-swap (some models)
  - Standard: One 560 watts (115-230 V ac)
  - Upgradeable to two hot-swap power supplies

Acoustical noise emissions:
- Sound power, idle: 6.3 bel maximum
- Sound power, operating: 6.3 bel maximum
- Sound pressure, idle: 48 dBa maximum
- Sound pressure, operating: 48 dBa maximum

Redundant cooling:

Six hot-swap fans

Electrical input:
- Sine-wave input (50-60 Hz) required
- Input voltage range automatically selected
- Input voltage low range:
  - Minimum: 90 V ac
  - Maximum: 137 V ac
- Input voltage high range:
  - Minimum: 180 V ac
  - Maximum: 265 V ac
- Input kilovolt-amperes (kVA) approximately:
  - Minimum: 0.1 kVA
  - Maximum: 0.8 kVA

Power available for drives:
- +5 V dc
- +12 V dc

Heat output:

Approximate heat output in British thermal units (Btu) per hour
- Minimum configuration: 341 Btu (100 watts/hour)
- Maximum configuration: 2600 Btu (760 watts/hour)

Environment:
- Air temperature:
  - Server on: 10° to 35°C (50° to 95°F) Altitude: 0 to 2134 m (7000 ft)
  - Server off: -40° to +60°C (-40° to 140°F) Maximum altitude: 2133 m (7000 ft)
- Humidity:
  - Server on: 8% to 80%
  - Server off: 8% to 80%

Size (tower model):
- Height: 440 mm (17.3 in.)
- Depth: 700 mm (27.5 in.)
- Width: 221 mm (8.7 in.)
- Weight: 33.5 kg (74 lb) to 45.8 kg (101 lb) depending upon configuration

Size (5 U) (rack configuration):
- Height: 216 mm (8.5 in.)
- Depth: 674 mm (26.5 in.)
- Width: 440 mm (17.3 in.)
- Weight: 33.5 kg (74 lb) to 45.8 kg (101 lb) depending upon configuration

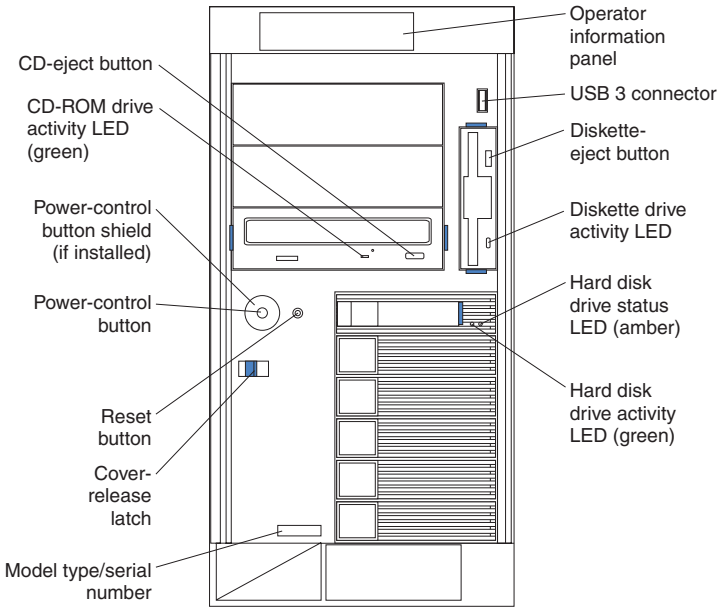
Server controls and indicators

This section identifies the controls and indicators on the front and rear of your server.

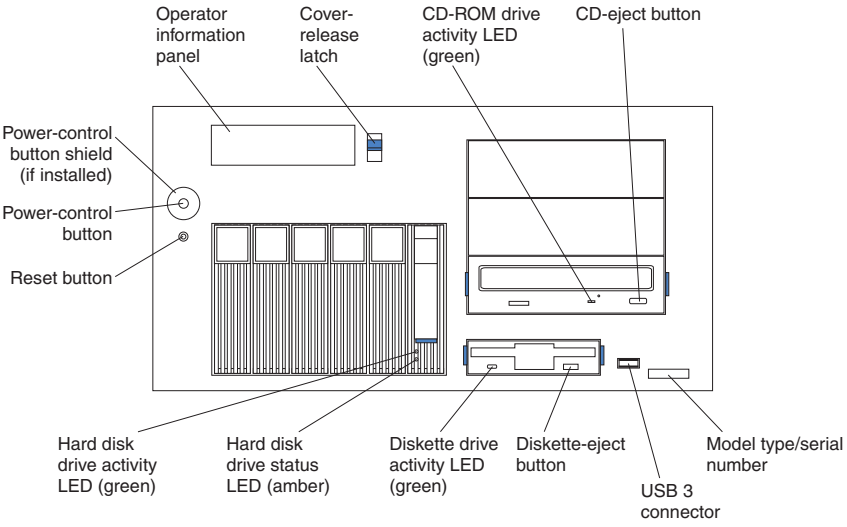
Note: The illustrations in this document might differ slightly from your hardware.

Front view

Tower model



Rack configuration



Operator information panel: The LEDs on this panel give status information for your server. See “Operator information panel” on page 7 for more information.

USB 3 connector: This is the front USB connector. Two additional USB connectors are on the rear of the server.

Diskette-eject button: Press this button to release a diskette from the drive.

Diskette-drive activity LED: When this LED is on, it indicates that the diskette drive is in use.

Hard disk drive activity LED: Each hot-swap drive has a hard disk drive activity LED. When this green LED is flashing, the drive is being accessed.

Hard disk drive status LED: Each hot-swap drive has a hard disk drive status LED. When this amber LED is on continuously, the drive has failed. If an optional IBM ServeRAID™ controller is installed in the server, when the LED flashes slowly (one flash per second), the drive is being rebuilt. When the LED flashes rapidly (three flashes per second), the controller is identifying the drive.

Model type/serial number: The model type identifies your server model. The serial number uniquely identifies your server.

Cover-release latch: Slide this latch to release the cover.

Reset button: Press this button to reset the server and run POST.

Power-control button: Press this button to manually turn on the server or put the server in Standby mode (see “Server power features” on page 8).

Power-control button shield: You can install this circular disk over the power-control button to prevent accidental manual power-off. This disk is provided with your server.

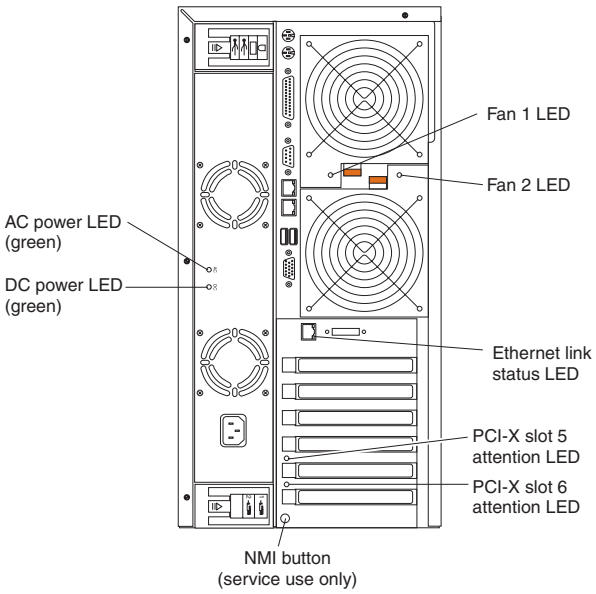
CD-ROM drive activity LED: When this LED is on, it indicates that the CD-ROM drive is in use.

CD-eject button: Press this button to release a CD from the drive.

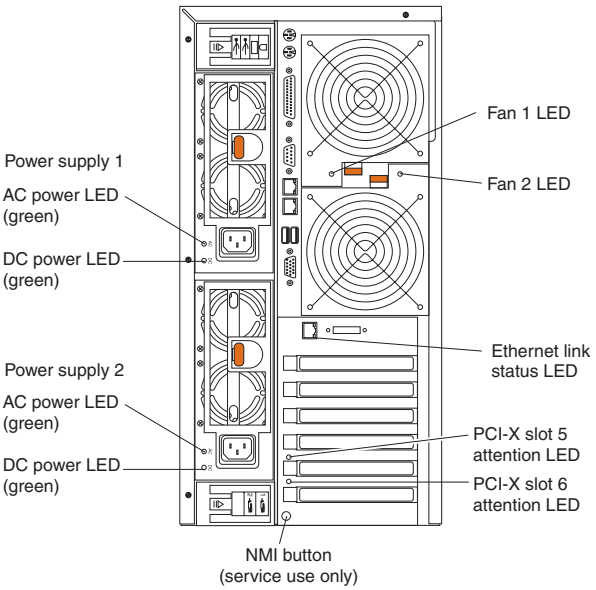
Rear view

This section identifies the indicators on the rear of your server. The following illustrations contain most of these indicators. More information is available at “Working with adapters” on page 60 and “Input/output connectors” on page 108.

Server with fixed power supply



Server with hot-swap power supplies



Fans 1 and 2 LEDs: These LEDs provide status information about rear fans 1 and 2. For additional information, see “Light Path Diagnostics” on page 38.

Ethernet link status LED: This LED is on the Ethernet connector. When this LED is on, there is an active connection on the Ethernet port.

PCI-X slot attention LED: This green LED flashes approximately once per second when it is on. This LED is visible from the rear of the server and from inside the

server. The meaning of the attention LED is defined by your operating system. For an illustration showing this LED on the system board, see “LEDs for Active PCI slots” on page 36.

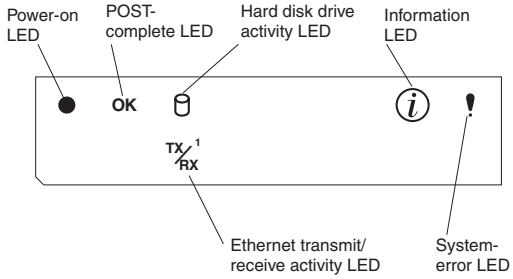
NMI button: The Non-Maskable Interrupt (NMI) button is for service use only.

DC power LED: This green LED provides status information about the power supply. During typical operation, both the ac and dc power LEDs are on. For any other combination of LEDs, see “Power-supply LED errors” on page 146.

AC power LED: This green LED provides status information about the power supply. During typical operation, both the ac and dc power LEDs are on. For any other combination of LEDs, see “Power-supply LED errors” on page 146.

Operator information panel

The following illustration shows the status LEDs on the operator information panel on the front of the server.



Important: If the power-on LED is off, it does not mean there is no electrical current present in the server. The LED might be burned out. To remove all electrical current from the server, you must unplug the server power cords from the electrical outlets or from the uninterruptible power device.

Power-on LED: When this green LED is on, power is present in the server. When this LED flashes, the server is in Standby mode (the system operating system is turned off and ac current is present). When this LED is off, the power subsystem, the ac power, or an LED has failed.

POST-complete LED: This green LED is on when POST is completed without any errors.

Hard disk drive activity LED: This green LED flickers when there is activity on a hard disk drive.

Information LED: When this amber LED is on, the server power supplies are nonredundant, or some other noncritical event has occurred. The event is recorded in the Error log. See “Viewing error logs from the Configuration/Setup Utility program” on page 32 for instructions for viewing the Error log. Check the diagnostic LED panel for more detailed information (see “Diagnostic panel system error LED” on page 132.

System-error LED: This amber LED is on when a system error occurs. An LED on the diagnostic LED panel will also be on to further isolate the error. (For more information, see “Diagnostic panel system error LED” on page 132.)

Ethernet transmit/receive activity LED: When this green LED is on, there is activity between the server and the network.

Server power features

This section contains information about how to properly turn your server on and off.

Turning on the server

Turning on the server refers to the act of plugging the power cords of your server into the power source and starting the operating system.

You can turn on the server in any of the following ways:

- If the power cords are connected to a power source, you can press the power-control button on the front of the server.

  Notes:

  1. You can install a circular disk over the power-control button to prevent accidental manual power-off. This disk, known as the power-control button shield, comes with your server.
  2. After you plug the power cords of your server into the electrical outlets, wait approximately 20 seconds before pressing the power-control button. During this time, the system-management adapter is initializing; therefore, the power-control button does not respond.
- If the server is turned on and a power failure occurs, the server will restart automatically when power is restored.
- If ac power is present, the server is in Standby mode, and the server is connected to an ASM interconnect network which contains at least one system with an optional Remote Supervisor Adapter installed, the server can be turned on from the Remote Supervisor Adapter user interface.
- If ac power is present, the server is in Standby mode, and an optional Remote Supervisor Adapter is installed in the server, the server can be turned on from the Remote Supervisor Adapter user interface.
- When you plug in your server for the first time, Wake on LAN® can turn on the server.
- If your server was previously turned on, it must be properly placed in Standby mode for the Wake on LAN feature to turn on the server.

Complete the following steps to manually turn on the server:

1. Review the information in “Safety information” on page 169.
2. Turn on all external devices, such as the monitor.
3. Plug the server power cords into the power source.
4. Press the power-control button on the front of the server.

Note: While the server is powering up, the power-on LED on the front of the server is lit.

Turning off the server

Turning off the server refers to the act of disconnecting the server from the power source.

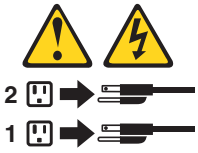
Complete the following steps to manually turn off the server:

1. Review the information in “Safety information” on page 169.
2. See your operating system documentation for the proper procedure to shut down the operating system.

   Statement 5:

CAUTION:

The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



3. Press the power-control button on the front of the server. This will put the server in Standby mode.

   Note: You might need to press and hold the power-control button for more than 4 seconds to cause an immediate shutdown of the server and to force it into Standby mode. You can use this feature if the operating system stops functioning.

4. Disconnect the server from the power source.

   Note: After disconnecting all the power cords, wait approximately 15 seconds for your system to stop running. Watch for the power-on LED on the front of the server to stop flashing.

Standby mode

Standby mode refers to the condition in which the server is connected to an ac power source but the server operating system is not running and all core logic is

shut down except for the service processor. In Standby mode, the server can respond to service processor requests, such as a remote request to turn on the server. When the server is in Standby mode, the power-on LED on the front of the server flashes (when the server is running, the power-on LED stays on and does not flash).

You can put the server in Standby mode in any of the following ways:

- You can press the power-control button on the server. This starts an orderly shutdown of the operating system, if this feature is supported by your operating system.
- If the server is connected to an ASM interconnect network which contains at least one system with an optional Remote Supervisor Adapter installed, the server can be placed in Standby mode from the Remote Supervisor Adapter user interface.
- If an optional Remote Supervisor Adapter is installed in the server, the server can be placed in Standby mode from the Remote Supervisor Adapter user interface.

  Attention: You must disconnect all the server power cords from the electrical outlets to remove all power from the server.

Complete the following steps to put the server into Standby mode:

1. See the operating system documentation for the proper procedure to shut down the operating system.

   Note: Each operating system is different. Read all the documentation about shutting down the operating system before continuing.
2. Press the power-control button on the front of the server.

   Notes:

   a. After you place the server in Standby mode, wait at least 5 seconds before you turn on the server again.

   b. You might need to press and hold the power-control button for more than 4 seconds to cause an immediate shutdown of the operating system and to force it into Standby mode. You can use this feature if the operating system stops functioning.

The ISMP can put the server in Standby mode as an automatic response to a critical system failure. You can also put the server into Standby mode remotely by means of an optional Remote Supervisor Adapter or through connection to an ASM interconnect network.

IBM documentation CD

Your server comes with a documentation CD, which contains documentation for your server in Portable Document Format (PDF) and includes the IBM Documentation Browser to help you find information quickly.

System requirements

To run the documentation CD, your system must have the following minimum hardware and software:

- Microsoft® Windows NT® 4.0 (with Service Pack 3 or later), Windows® 98, or Windows 2000.
- 100 MHz Intel Pentium® microprocessor.
- 32 MB RAM.

- Adobe Acrobat Reader 3.0 or later. Adobe Acrobat Reader software is included on the documentation CD, and you can install it when you run the IBM Documentation Browser.

Starting the IBM Documentation Browser

Use one of the following procedures to start the Documentation Browser:

- If Autostart is enabled, insert the documentation CD into your CD-ROM drive. The Documentation Browser will start automatically.
- If Autostart is disabled, insert the documentation CD into your CD-ROM drive; then, click **Start --> Run**. In the **Open** field, type

  e:\win32.bat

  where *e* is the drive letter of your CD-ROM drive, and click **OK**.

Using the IBM Documentation Browser

Use the IBM Documentation Browser to browse the contents of the documentation CD, select from a list of available topics, see brief descriptions of the selected topics, and view selected topics using Adobe Acrobat Reader. The Documentation Browser automatically detects the regional settings in use on your system and presents the information in the language for that region (if available). If a topic is not available in the language for that region, the English version is displayed.

Click **Help** for detailed information about using the IBM Documentation Browser.

Complete the following steps to use the Documentation Browser:

1. Select your product from the **Product** drop-down list.

   The **Topics** list appears. It lists all topics that pertain to the selected product. Topics are in folders or under other topics. A plus sign (+) appears beside each folder or topic that has additional topics under it. Click the plus sign to display the additional topics.
2. Click a topic to select it.

   When you select a topic, a description of the topic contents appears in the **Description** field.

   Note: To select multiple topics, press and hold down the Ctrl key while selecting your topics.
3. View selected topics.

   Click **View Book**. Adobe Acrobat Reader starts, and the selected topics are displayed.

Using the search feature

Complete the following steps to use the Documentation Browser search feature:

1. Type a key word in the **Search** field.
2. Click **Search**. The topics containing the search word are listed in order based on the number of occurrences.
3. Click a file to open it.
4. Press Ctrl+F and use the Adobe Acrobat search function to search within the file.

IBM Director

With IBM Director, a network administrator can:

- View the hardware configuration of remote systems, in detail
- Monitor the usage and performance of critical components, such as microprocessors, disks, and memory
- Centrally manage individual or large groups of IBM and non-IBM Intel-based servers, desktop computers, workstations, and mobile computers on a variety of platforms

IBM Director provides a comprehensive entry-level workgroup hardware manager. Key features include:

- Advanced self-management capabilities for maximum system availability
- Multiple operating-system platform support, including Microsoft Windows 98, Windows NT, Windows 2000, Windows XP Professional, Novell NetWare, IBM OS/2®, SCO UnixWare, Linux®, and Caldera OpenUNIX®
- Support for IBM and non-IBM servers, desktop computers, workstations, and mobile computers
- Support for systems-management industry standards
- Integration into leading workgroup and enterprise systems-management environments
- Ease of use, training, and setup

IBM Director also provides an extensible platform that supports advanced server tools that are designed to reduce the total cost of managing and supporting networked systems. By deploying IBM Director, you can achieve reductions in ownership costs through:

- Reduced downtime
- Increased productivity of IT personnel and users
- Reduced service and support costs

For more information about IBM Director, see the *IBM Director* CD that comes with your server, the IBM Director publications on the CD, and the following Web pages:

Systems Management - Director Package
http://www.ibm.com/pc/qtechinfo/MIGR-40738.html

This Web page includes links to software downloads and publications for the latest release of IBM Director.

IBM xSeries Systems Management page
http://www.ibm.com/pc/ww/eserver/xseries/systems_management/index.html

This Web page presents an overview of IBM Systems Management and IBM Director.

IBM Universal Manageability page
http://www.ibm.com/pc/us/pc/um/index.html

This Web page links to an IBM portfolio of advanced management tools that help reduce costs and increase availability throughout the life cycle of a product.

Installing IBM Director updates

If you plan to use IBM Director to manage your server, you must install the applicable IBM Director updates, which could include a Service Pack for your release of IBM Director, individual emergency fixes (eFixes), and a Director System Support Package (DSSP) for this server.

Note: For Automatic Server Restart (ASR) support and environmental-sensor support, you must install version 4.1 of IBM Director.

To install the IBM Director updates, complete the following steps, in order:

1. If you plan to enable the Automatic Server Restart (ASR) feature, install the ASR device driver, which is available from the IBM Web site:
   a. Go to the IBM Web site at http://www.ibm.com.
   b. Click **Support & downloads**.
   c. In the **Technical support** keyword search field, type `Advanced System Management 8647` and click **Go**.
   d. From the next page, click **IBM Advanced System Management Device Driver Diskette for Microsoft Windows 2000 and Windows NT 4.0 Version 2.07** (or a later version, if it is available).
   e. From the next page, download the executable file and follow the instructions in the readme file to install the device driver.
2. Install the IBM Director application.
3. If the IBM Director CD that comes with your server includes the IBM Director Service Pack, install the Service Pack. If the CD does not contain the Service Pack, check the IBM Web site to see if a Service Pack is available. If it is, download and install the Service Pack according to the instructions in its readme file.
4. Install any applicable eFixes, DSSPs, and additional updates for your server from the IBM Web site.

Complete the following steps to obtain and install eFixes, DSSPs, or other updates:

1. Go to the IBM Web site at http://www.ibm.com.
2. Click **Support & downloads**.
3. In the **Technical support** keyword search field, type `Director 8647` and click **Go**.
4. From the next page, click the eFix, DSSP, or update that you want to download.
5. From the next page, download the executable file and follow the instructions in the readme file to install the update.

Update*Xpress*

The Update*Xpress* program is available for most xSeries servers and server options. It detects supported and installed device drivers and firmware in your server and installs available updates. You can download the UpdateXpress program from the Web at no additional cost, or you can purchase it on a CD. To download the program or purchase the CD, go to http://www.ibm.com/pc/ww/eserver/xseries/serverguide/xpress.html.

Chapter 2. Configuration

The following configuration programs are provided with your server:

- **Configuration/Setup Utility**

  This program is part of the basic input/output system (BIOS) code that comes with your server. You can use this program to configure serial and parallel port assignments, change interrupt request (IRQ) settings, change the drive startup sequence, set the date and time, and set passwords. You also can use this program to view the system configuration settings, for example, the number and type of installed microprocessors, the amount of installed memory, or the BIOS diagnostics version level. See "Using the Configuration/Setup Utility program" for more information.

- **LSI Logic Configuration Utility**

  With the built-in LSI Logic Configuration Utility program, you can configure the integrated SCSI controller and the devices that are attached to it. See "Using the LSI Logic Configuration Utility program" on page 21.

- **ServeRAID Manager**

  The ServeRAID programs come with your server. If your server has a ServeRAID controller installed, or if you are using the integrated SCSI controller with RAID capabilities as a RAID controller, you must use the ServeRAID Manager program to define and configure your disk-array subsystem *before* you install your operating system. See "Using ServeRAID Manager" on page 25 for more information.

- **ServerGuide Setup and Installation CD**

  The *ServerGuide Setup and Installation* CD provides software setup tools and installation tools that are designed for your IBM server. Use this CD during the initial installation of your server to configure basic hardware features, such as an integrated SCSI controller with RAID capabilities, and to simplify your operating system installation. See "Using the ServerGuide Setup and Installation CD" on page 22.

- **Ethernet controller configuration process**

  To configure the integrated Ethernet controller, see "Configuring the Gigabit Ethernet controller" on page 26.

- **Integrated System Management update and configuration**

  To update the integrated system management (ISM) firmware, see "Updating the integrated system management firmware" on page 27.

Using the Configuration/Setup Utility program

This section provides instructions to start the Configuration/Setup Utility program and descriptions of the available menu choices.

Starting the Configuration/Setup Utility program

To start the Configuration/Setup Utility program:

1. Turn on the server and watch the monitor screen.
2. When the message `Press F1 for Configuration/Setup` appears, press F1.

   Note: If you have set both levels of passwords (power-on and administrator), you must type the administrator password to access the full Configuration/Setup Utility menu. Without the administrator password, limited Configuration/Setup Utility program functions are available.

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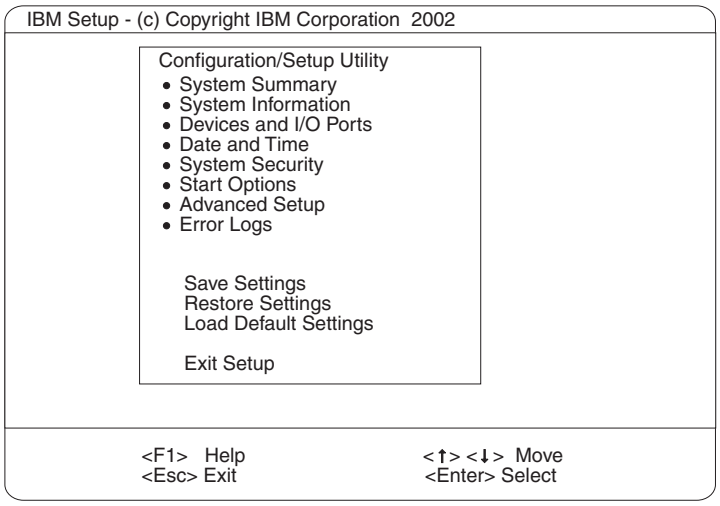
3. Follow the instructions that appear on the screen.

Choices available from the Configuration/Setup main menu

From the Configuration/Setup Utility main menu, you can select settings that you want to view or change. The Configuration/Setup Utility main menu is similar to the following.



Notes:

1. You can press F1 to display help information for a selected menu item.
2. The choices on some menus might differ slightly, depending on the BIOS version in your server.

Descriptions of the choices available from the main menu are:

- **System Summary**

  Select this choice to display configuration information. This includes the type, speed, and cache sizes of the microprocessors and the amount of memory installed.

  Changes that you make to configuration settings appear on this summary screen. You cannot edit the fields.

  This choice appears on both the full and limited Configuration/Setup Utility menus.

- **System Information**

  Select this choice to display information about your server. Changes that you make on other menus might appear on this summary screen. You cannot edit any fields. The **System Information** choice appears only on the full Configuration/Setup Utility main menu.

  – **Product Data**

    Select this choice to view system information, such as the machine type and model, the server serial number, and the revision level or issue date of the BIOS and diagnostics code stored in the electrically erasable programmable ROM (EEPROM).

- **Devices and I/O Ports**

  Select this choice to view or change the assignments for devices and input/output (I/O) ports. This choice appears only on the full Configuration/Setup Utility main menu.

You can use this choice also to enable or disable the integrated SCSI controller with RAID capabilities and Ethernet controllers, and all standard ports (serial, parallel, and so on).

- The default setting is **Enable** for all the controllers. If you select **Disable**, the system will not configure the disabled device and the operating system will not detect the device. (This is equivalent to unplugging the device.)
- If the integrated SCSI controller with RAID capabilities is disabled and no SCSI adapter is installed, the server will have no SCSI capability.
- If the on-board Ethernet controller is disabled and no Ethernet adapter is installed, the server will have no Ethernet capability.

- **Date and Time**

  Select this choice to set the system date and time. This choice appears only on the full Configuration/Setup Utility main menu.

  The system time is in a 24-hour format (hour:minute:second).

- **System Security**

  Select this choice to set passwords or the Remote Control Security settings. This choice appears only on the full Configuration/Setup Utility main menu.

  You can implement two levels of password protection:

  - **Power-on Password**

    Select this choice to set or change a power-on password. See “Using passwords” on page 19 for more information.

  - **Administrator Password**

    Attention: If an administrator password is set and then forgotten, it cannot be overridden or removed. You must replace the system board.

    Note: This choice is available on the Configuration/Setup Utility menu only if the optional IBM Remote Supervisor Adapter is installed in your server.

    Select this choice to set or change an administrator password.

    The administrator password provides access to all choices on the Configuration/Setup Utility main menu. You can set, change, or delete both the administrator and power-on passwords and allow a power-on password to be changed by the user.

    See “Using passwords” on page 19 for more information.

- **Start Options**

  Select this choice to view or change the start options. This choice appears only on the full Configuration/Setup Utility main menu. Start options take effect when you start your server.

  You can select keyboard operating characteristics, such as the keyboard speed. You also can specify whether the keyboard number lock starts on or off. You also can enable the server to run without a diskette drive, monitor, or keyboard.

  The server uses a startup sequence to determine the device from which the operating system is loaded. For example, you can define a startup sequence that checks for a startable diskette in the diskette drive, then checks the hard disk drive in bay 0, and then checks a network adapter.

  If your server contains Wake on LAN hardware and software and your operating system supports Wake on LAN functions, you can also define a startup sequence for the Wake on LAN functions.

If the **Boot Fail Count** choice is enabled, you can restore the BIOS system defaults after three consecutive boot failures. If this choice is disabled, the BIOS system defaults can be loaded only from the Configuration/Setup Utility main menu.

You also can select whether the integrated SCSI controller with RAID capabilities or a PCI SCSI adapter is given boot precedence. Select **Planar SCSI** to give the integrated SCSI controller with RAID capabilities boot precedence. If a PCI SCSI adapter is to be given boot precedence, select the slot number where this adapter is installed.

You can enable a virus-detection test that checks for changes in the master boot record at startup.

- **Advanced Setup**

  Select this choice to change values for advanced hardware features, such as cache control, and PCI configuration. This choice appears only on the full Configuration/Setup Utility main menu.

  A warning message appears above the choices on this menu to alert you that the system might malfunction if these options are configured incorrectly. Follow the instructions on the screen carefully.

  – **System Partition Visibility**

    Select this choice to indicate whether the System Partition is visible. To make the System Partition visible, set this choice to **Visible**. To make the System Partition invisible, set this choice to **Hidden**. See "Using the ServerGuide Setup and Installation CD" on page 22 for additional information about the System Partition.

  – **Memory Settings**

    Select this choice to manually enable a pair of memory connectors.

    If a memory error is detected during POST or memory configuration, the server will automatically disable the failing pair of memory connectors and continue operating with reduced memory capacity. If this occurs, you must manually enable the set of memory connectors after the problem is corrected. Select **Memory Settings** from the **Advanced Setup** menu, and use the arrow keys to highlight the pair of memory connectors that you want to enable; then, use the arrow keys to select **Enable**.

  – **CPU Options**

    Select this choice to indicate whether the microprocessor serial number in the microprocessor is readable or to set the microprocessor cache mode to disabled, write-back, or write-through. Selecting write-back mode will provide better system performance.

  – **PCI Bus Control**

    Select this choice to view and set interrupts for PCI devices and to configure the master latency timer value for the server.

  – **Integrated System Management Processor Settings**

    You can view and enable or disable the **Reboot on System NMI** setting on this menu. If this setting is enabled, the server will automatically restart 60 seconds after the service processor issues an Non-maskable interrupt (NMI) to the server. If this setting is disabled, the server will not restart. The default value is **Enable**.

- **Error Logs**

  Select this choice to view or clear error logs.

  – Select **POST Error Log** to view the three most recent error codes and messages that the system generated during POST.

Select **Clear event/error logs** from the **POST Error Log** menu to clear the POST Error Log.

– Select **System Event/Error Log** to view the System Event/Error Log. The System Event/Error Log contains all the system error and warning messages that the system has generated. You can use the arrow keys to move between pages in the System Event/Error Log.

  Select **Clear event/error logs** from the **System Event/Error Log** menu to clear the System Event/Error Log.

- **Save Settings**

  Select this choice to save your customized settings.

- **Restore Settings**

  Select this choice to delete your changes.

- **Load Default Settings**

  Select this choice to cancel your changes.

- **Exit Setup**

  If you have made any changes and not saved them, the program will prompt you to save the changes or exit without saving the changes.

Additional Configuration/Setup Utility menu choices

When you install an IBM Remote Supervisor Adapter in your server, you can view additional menu choices in the Configuration/Setup Utility program, such as:

- **System Card Data**

  Select this choice to display information about your server.

- **PCI Slot/Device Information**

  Select this choice to view the properties of adapters installed in PCI slots.

- **Administrator Password**

  Select this choice to set or change the administrator password.

- **Remote Control Security Settings**

  Select this choice to set a remote-control password. When you set a remote-control password, you can also set the number of failed attempts to enter the correct remote-control password, and the duration before another attempt is allowed.

For a list of supported options for your server, go to http://www.ibm.com/pc/us/compat/ on the World Wide Web. To order an optional Remote Supervisor Adapter, contact your IBM Reseller or an IBM marketing representative.

Using passwords

The **System Security** choice appears only on the full Configuration/Setup Utility menu. After you select this choice, you can implement two levels of password protection: power-on password and administrator password. The administrator password is available only if the optional IBM Remote Supervisor Adapter is installed in your server.

Power-on password

After you set a power-on password, you can enable the Unattended Start mode. This locks the keyboard and mouse but enables the operating system to start. The keyboard and mouse remain locked until you type the correct password.

You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for your power-on password. Keep a record of your password in a secure place. When a power-on password is set, POST is not completed until you type the password. If you forget the power-on password, you can regain access to the server through one of the following methods:

- If an administrator password is set, type the administrator password at the power-on prompt. (If necessary, see “Administrator password” for details.) Start the Configuration/Setup Utility program and change the power-on password.
- Remove the battery and then reinstall the battery (see “Replacing the battery” on page 97).
- Change the position of the power-on password override switch (switch 6 on switch block 1) as described below to bypass the power-on password check. You can then start the Configuration/Setup Utility program and change the power-on password.

  Notes:

  1. Before changing any switch settings or moving any jumpers, turn off the server; then, disconnect all power cords and external cables.
  2. Any system-board switch or jumper blocks that are not shown in the illustrations in this book are reserved.

  Power-on password override (switch 6)

  Changing the position of this switch bypasses the power-on password check the next time the server is powered on. You do not need to move the switch back after the password is overridden. The default position is Off. To bypass the power-on password check, move the switch to the opposite position. Changing the position of this switch does not affect the administrator password check if an administrator password is set.

Administrator password

Select this choice to set an administrator password. The administrator password provides access to all choices on the Configuration/Setup Utility main menu. You can set, change, or delete both the administrator and power-on passwords and allow a power-on password to be changed by the user. You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for your administrator password. Keep a record of your password in a secure place. The administrator password is available only if the optional IBM Remote Supervisor Adapter is installed in your server.

Attention: If an administrator password is set and then forgotten, it cannot be overridden or removed. You must replace the system board.

The following table provides a summary of the password features.

Table 2. Power-on and administrator password features

Type of password	Features
Power-on password	• Type the password to complete the system startup. • All choices are available on the Configuration/Setup Utility main menu.
Administrator password	• No password is required to complete the system startup. • Type the password to access the Configuration/Setup Utility program. • All choices are available on the Configuration/Setup Utility main menu.

Table 2. Power-on and administrator password features (continued)

Type of password	Features
Administrator *and* power-on password	• You can type either password to complete the system startup. • The administrator password provides access to all choices on the Configuration/Setup Utility main menu. You can set, change, or delete both the administrator and power-on passwords and allow a power-on password to be changed by the user. • The power-on password provides access to a limited set of choices on the Configuration/Setup Utility main menu. This limited access might include changing or deleting the power-on password.

Using the LSI Logic Configuration Utility program

LSI Logic Configuration is a built-in, menu-driven configuration utility program that you can use to:

- Perform a low-level format of a SCSI hard disk drive
- Set a SCSI device scan order
- Set a SCSI ID for a controller

Notes:

1. The integrated SCSI controller with RAID capabilities in your server supports only RAID level-1 and RAID level-1 Enhanced (RAID level-1E). Installing an optional ServeRAID-5i controller provides additional RAID levels. However, if a ServeRAID-5i controller is installed and later removed, you must re-enable the on-board SCSI controller in using the Configuration/Setup Utility program (see “Starting the Configuration/Setup Utility program” on page 15). See “Using ServeRAID Manager” on page 25 for information on configuring your server for RAID operation.
2. If you install a different type of RAID adapter in your server, use the configuration method supplied with the RAID adapter to view or change SCSI settings for attached devices.

The following sections provide the instructions needed to start the LSI Logic Configuration Utility program and to format a SCSI hard disk drive.

Starting the LSI Logic Configuration Utility program

Complete the following steps to start the LSI Logic Configuration Utility program:

1. Turn on the server.
2. When the `<<< Press <CTRL><C> to start LSI Logic Configuration Utility >>>` prompt appears, press Ctrl+C.

   Note: If an administrator password has been set, you are prompted to type the password to start the LSI Logic Configuration Utility program.
3. Use the arrow keys to select a controller (channel) from the list of adapters; then, press Enter.
4. Follow the instructions on the resulting screen to change the settings of the selected items; then, press Enter. The **Device Properties** and **Mirroring Properties** choices produce additional screens of parameters to review or change.

Formatting a SCSI hard disk drive

You can use the LSI Logic Configuration Utility program to perform a low-level format on a SCSI hard disk drive. Complete the following steps to format a drive:

1. Select the controller channel for the drive to format from the list of adapters.
2. Select **Device Properties** from the resulting screen.
3. Use the arrow keys (↑ or ↓) to highlight the drive to format.
4. Use the arrow keys (← or →) or the End key to scroll to the right.
5. Highlight the **Format** item; then, press Enter to begin the low-level formatting operation.

Using the ServerGuide Setup and Installation CD

The *ServerGuide Setup and Installation* CD includes an easy-to-use setup and installation program that is designed for your IBM server. The ServerGuide program detects the server model and hardware options that are installed and uses that information during setup to configure the hardware. The ServerGuide program simplifies operating-system installations by providing updated device drivers and, in some cases, installing them automatically.

If a later version of the ServerGuide program is available, you can download a free image of the *ServerGuide Setup and Installation* CD, or you can purchase the CD. To download the image, go to the IBM ServerGuide Web page at http://www.ibm.com/pc/qtechinfo/MIGR-4ZKPPT.html. To purchase the latest *ServerGuide Setup and Installation* CD, go to the ServerGuide fulfillment Web site at http://www.ibm.com/pc/coupon/.

The ServerGuide program has the following features to make setup easier:

- An easy-to-use interface with online help
- Diskette-free setup, and configuration programs that are based on detected hardware
- ServeRAID Manager program, which configures your ServeRAID adapter or integrated SCSI controller with RAID capabilities
- A system BIOS code update program, which updates the BIOS code directly from the CD
- Device drivers that are provided for your server model and detected hardware
- Operating-system partition size and file-system type that are selectable during setup

ServerGuide features

Features and functions can vary slightly with different versions of the ServerGuide program. To learn more about the version that you have, start the *ServerGuide Setup and Installation* CD and view the online overview. Not all features are supported on all server models.

The ServerGuide program requires a supported IBM server with an enabled startable (bootable) CD-ROM drive. In addition to the *ServerGuide Setup and Installation* CD, you must have your operating-system CD to install your operating system.

The ServerGuide program has the following features:

- Sets system date and time.

- Detects the SCSI RAID adapter, controller, or integrated SCSI controller with RAID capabilities and runs the SCSI RAID configuration program.
- Updates the licensed internal code (firmware) level without diskettes.
- Checks the system BIOS code and microcode (firmware) levels of supported options to determine whether a later level is available from the CD. You can perform updates without using diskettes.
- Creates a System Partition on the default drive. You can run server-specific utility programs after setup.
- Detects installed hardware options and provides updated device drivers for most adapters and devices.
- Creates a setup-replication diskette for replicating setup selections for other servers of the same model.
- Provides diskette-free installation for supported operating systems.
- Provides a replicated installation path for multiple installations of supported operating systems.
- Includes an online README file with links to tips for your hardware and operating-system installation.

Setup and configuration overview

When you use the *ServerGuide Setup and Installation* CD, you do not need setup diskettes. You can use the CD to configure any supported IBM server model. The ServerGuide program checks your system BIOS, service processors, and other system hardware to determine if system updates are available. The setup program provides a list of tasks that are required to set up your server model. On a server with a ServeRAID adapter or integrated SCSI controller with RAID capabilities, you can run the SCSI RAID configuration program to create logical drives.

Note: Features and functions can vary slightly with different versions of the ServerGuide program.

When you start the *ServerGuide Setup and Installation* CD, the program performs the following tasks:

- The ServerGuide program prompts you for your language, country, and keyboard layout. (This information is stored and later passed to the operating-system installation program.)
- The ServerGuide program displays choices for running the configuration programs. For example:
  - The Express Configuration method runs the required programs for your server, based on the hardware that is detected.
  - The Custom Configuration method displays all programs that are available for your server, and you decide which programs to run.
  - The Replicated Configuration method provides the option of duplicating your setup selections to other servers that are the same model.
- If you select the Custom Configuration method, the following features are optional. If you select the Express Configuration method, some or all of these features are run, depending on the hardware that is detected:
  - The Set Date and Time feature is provided so that you do not have to use the Configuration/Setup Utility program to access these settings.
  - The Clear Hard Disks feature is provided so you can delete all partitions on all hard disk drives.
  - The ServerGuide program checks the server BIOS code and microcode (firmware) levels for supported options and then checks the CD for a newer level. The CD content might be newer than the BIOS code and firmware level.

The ServerGuide program can perform a flash update of the BIOS code and supported microcode (firmware) options without using diskettes.
  - The SCSI RAID configuration program starts, leading you through the entire configuration process.
  - The ServerGuide program creates a System Partition on the default drive.
- The ServerGuide program displays a confirmation summary, so that you will know when you have completed all the required tasks. Then, you are ready to install your operating system.

Notes:

1. Plug and Play adapters are configured automatically. Non-Plug and Play adapters or non-IBM adapters might require switch settings, additional device drivers, and installation after the operating system is installed. See the documentation that comes with the adapter.
2. Diagnostics for your server come in BIOS code or on a separate diagnostics CD.

System Partition

The ServerGuide program creates a 50 MB System Partition on the default drive. The System Partition contains server-specific utility programs such as service-processor disk operating system (DOS) utilities, system diagnostics, flash BIOS updates, and other programs. Programs in the System Partition vary by server model, and not all server models run utility programs from the System Partition. To determine which ones do, start the *ServerGuide Setup and Installation* CD and view the online overview.

After setup is complete, you can access programs in the System Partition by restarting the server and pressing Alt+F1 when the prompt is displayed. The **System Partition** menu displays the programs that are available on your server model.

Typical operating-system installation

You can use the ServerGuide program to shorten your installation time. The ServerGuide program provides the device drivers that are required for your hardware and for the operating system that you are installing. This section describes a typical ServerGuide operating-system installation.

Note: Features and functions can vary slightly with different versions of the ServerGuide program.

1. After you have completed the setup process, the operating-system installation program starts. (You will need your operating-system CD to complete the installation.)
2. The ServerGuide program stores information about the server model, service processor, hard disk drive controllers, and network adapters. Then, the program checks the CD for newer device drivers. This information is stored and then passed to the operating-system installation program.
3. With some operating-system installations, you can create an operating-system replication diskette for setting up additional servers. This diskette contains the Internet protocol (IP) address, server name, and other selections.
4. The ServerGuide program presents operating-system partition options that are based on your operating-system selection and the installed hard disk drives.

5. If you are installing the operating system from diskettes, the ServerGuide program lists the diskettes that you must create and the optional device-driver diskettes (for installed adapters or controllers) that you might want to create.
6. The ServerGuide program prompts you to insert your operating-system CD and restart the server. At this point, the installation program for the operating system takes control to complete the installation.

Setting up or updating multiple servers

You can use the ServerGuide program to create diskettes that help you set up or update multiple servers. You can modify information on the diskettes as you use them to set up or update other servers.

Note: Availability and function can vary by server model and by the hardware that is installed.

You can create a setup-replication diskette, which contains your hardware configuration selections. Use this diskette to replicate selections to other servers that are of the same model.

You can create an operating-system replication diskette, which contains information that you need to complete multiple installations. Not all operating systems support operating-system replication diskettes.

Installing your operating system without ServerGuide

If you have already configured the server hardware and you decide not to use the ServerGuide program to install your operating system, complete the following steps to download the latest operating-system installation instructions from the IBM Support Web page:

1. Go to http://www.ibm.com/pc/support/.
2. Under **Browse**, click **Servers**.
3. From the **Family** drop-down list, select your server model.
4. If operating-system installation instructions are available for your server model, **OS installation** is in the list in the upper-left corner of the Web page. Click **OS installation** and select the instructions for your operating system.

Using ServeRAID Manager

You can use the ServeRAID Manager program, provided on the *IBM ServeRAID Support* CD, to:

- Configure a redundant array of independent disks (RAID)
- Restore a SCSI hard disk to factory-default settings, erasing all data
- View your RAID configuration and associated devices
- Monitor operation of your RAID controllers

The ServeRAID Manager program operates in two ways:

- Startable-CD mode
- As an installed software program

See the ServeRAID documentation on the *IBM ServeRAID Support* CD for additional information about RAID technology and instructions for using ServeRAID

Manager. The *Installation Guide* for your server also contains instructions for using ServeRAID Manager to configure your integrated SCSI controller with RAID capabilities.

Notes:

1. The integrated SCSI controller with RAID capabilities in your server supports only RAID level-1 and RAID level-1 Enhanced (RAID level-1E). Installing an optional ServeRAID-5i controller provides additional RAID levels. However, if a ServeRAID-5i controller is installed and later removed, you must re-enable the on-board SCSI controller in using the Configuration/Setup Utility program (see "Starting the Configuration/Setup Utility program" on page 15).
2. If you install a different type of RAID adapter in your server, use the configuration method supplied with the RAID adapter to view or change SCSI settings for attached devices.

Before you install your operating system, you must configure the controller that is attached to the hard disk drives. You must use the configuration program on the *IBM ServeRAID Support* CD to configure the integrated SCSI controller with RAID capabilities or to configure an optional IBM ServeRAID controller.

Notes:

1. You cannot use the *ServerGuide Setup and Installation* CD to configure the optional controllers.
2. To update the firmware and BIOS for an optional ServeRAID controller, you must use the *IBM ServeRAID Support* CD that comes with the ServeRAID option.

Configuring the Gigabit Ethernet controller

The Ethernet controller is integrated on the system board. This controller provides an interface for connecting to 10-Mbps, 100-Mbps, or 1000-Mbps networks and provides full duplex (FDX) capability, which enables simultaneous transmission and reception of data on the Ethernet local area network (LAN). You do not need to set any jumpers or configure the controller for your operating system before you use the Ethernet controller. However, you must install a device driver to enable your operating system to address the Ethernet controller. The device drivers are provided on the *ServerGuide Setup and Installation* CD.

When you connect your server to the network, the Ethernet controller automatically detects the data-transfer rate (10-Mbps, 100-Mbps, or 1000-Mbps) on the network and then sets the controller to operate at the appropriate rate. In addition, if the Ethernet ports that your server is connected to support auto-negotiation, the Gigabit Ethernet controller will set the appropriate duplex state. That is, the Ethernet controller will adjust to the network data rate, whether the data rate is standard Ethernet (10BASE-T), Fast Ethernet (100BASE-TX/1000BASE-T), half duplex (HDX), or full duplex (FDX). The controller supports half-duplex (HDX) and full-duplex (FDX) modes at both speeds.

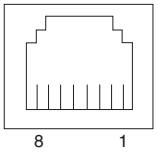
For updated information on configuring your Ethernet controller, go to the IBM Support Web site at http://www.ibm.com/pc/support and navigate to the area for your specific server type. From this area you can download documentation, the most current device drivers for your server, and software that supports advanced networking functions. After downloading, run the downloaded program *launch.exe*.

High-performance Ethernet modes

Your Ethernet controller supports optional modes, such as teaming, priority packets, load balancing, fault tolerance, and virtual LANs, which provide higher performance, security, and throughput for your server. These modes apply to the integrated Ethernet controller and to the controllers on supported Ethernet adapters.

Ethernet port connector

The following illustration shows the pin-number assignments for the RJ-45 connector. These assignments apply to both 10BASE-T and 100/1000BASE-TX devices.



Updating the integrated system management firmware

To update the integrated system management (ISM) firmware for the integrated system management processor (ISMP), download the Integrated System Management Firmware Update Utility program for your server from the IBM Support Web site at http://www.ibm.com/pc/support/. Then run the Integrated System Management Firmware Update Utility program to create a diskette to use to update the ISM firmware. This diskette updates the ISM firmware only and does not affect any device drivers.

Complete the following steps to update the ISM firmware:

1. Turn off your server.
2. Insert the diskette into the diskette drive.
3. Turn on your server. If your server does not start from the diskette drive, use the Configuration/Setup Utility program to configure the diskette drive as a startup device. See “Using the Configuration/Setup Utility program” on page 15. Then, start again at step 1
4. From the main menu, select **Update System Management Firmware** and press Enter.
5. Follow the on-screen instructions to complete the update.

If there is an error in updating the ISM firmware, try installing it again.

Chapter 3. Diagnostics

This section provides basic troubleshooting information to help you resolve some common problems that might occur with your server.

If you cannot locate and correct the problem using the information in this section, see Appendix A, “Getting help and technical assistance”, on page 167 for more information.

General checkout

The server diagnostic programs are stored in upgradeable read-only memory (ROM) on the system board. These programs are the primary method of testing the major components of the server: the system board, Ethernet controller, video controller, RAM, keyboard, mouse (pointing device), diskette drive, serial ports, and hard disk drives. You can also use the diagnostic programs to test some external devices. See “Diagnostic programs and error messages” on page 33.

If you cannot determine whether a problem is caused by the hardware or by the software, you can run the diagnostic programs to confirm that the hardware is working properly.

When you run the diagnostic programs, a single problem might cause several error messages. When this occurs, work to correct the cause of the first error message. After the cause of the first error message is corrected, the other error messages might not occur the next time you run the test.

A failed system might be part of a shared DASD cluster (two or more systems sharing one or more external storage devices). Before you run diagnostics, verify that the failing system is not part of a shared DASD cluster.

A system might be part of a cluster if:

- The system is identified as part of a cluster.
- One or more external storage units are attached to the system and at least one of the attached storage units is also attached to another system or unidentifiable source.
- One or more systems are located near the failing system.

If the failing system is suspected to be part of a shared DASD cluster, you can run all diagnostic tests except the diagnostic tests that test the storage unit (DASD residing in the storage unit) or the storage adapter attached to the storage unit.

Notes:

1. For systems that are part of a shared DASD cluster, run one test at a time in looped mode. Do not run all tests in looped mode, because this could enable the DASD diagnostic tests.
2. If multiple error codes are displayed, diagnose the first error code that is displayed.
3. If the computer stops with a POST error, go to “POST error codes” on page 147.
4. If the computer stops and no error is displayed, go to “Undetermined problems” on page 157.
5. For power supply problems, see “Power-supply LED errors” on page 146.
6. For safety information, see “Safety information” on page 169.

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7. For intermittent problems, check the error log.

001 **IS THE SYSTEM PART OF A CLUSTER?**

YES. Schedule maintenance for the system. Shut down all systems related to the cluster. Run the storage test.

NO. Go to step **002** .

002 **IF THE SYSTEM IS NOT PART OF A CLUSTER:**

1. Turn off the server and all external devices.
2. Check all cables and power cords.
3. Set all display controls to the middle position.
4. Turn on all external devices.
5. Turn on the server.
6. Record any POST error messages that are displayed on the screen. If an error is displayed, look up the first error in the “POST error codes” on page 147.
7. Check the information LED panel System Error LED; if it is on, see “Diagnostic panel system error LED” on page 132.
8. Check the System Error log. If an error was recorded by the system, see Chapter 6, “Symptom-to-FRU index”, on page 129.
9. Start the diagnostic programs.
10. Check for the following responses:
    - One beep.
    - Readable instructions or the main menu.

003 **DID YOU RECEIVE BOTH OF THE CORRECT RESPONSES?**

NO. Find the failure symptom in Chapter 6, “Symptom-to-FRU index”, on page 129.

YES. Run the diagnostic programs. If necessary, see “Diagnostic programs and error messages” on page 33.

If you receive an error, see Chapter 6, “Symptom-to-FRU index”, on page 129.

If the diagnostic programs were completed successfully and you still suspect a problem, see “Undetermined problems” on page 157.

Diagnostic tools overview

The following tools are available to help you identify and resolve hardware-related problems:

- **POST beep codes and error messages**

  The power-on self-test (POST) generates beep codes and messages to indicate successful test completion or the detection of a problem. See “POST error logs” for more information.

- **Error log**

  The POST error log contains the three most recent error codes and messages that the system has generated during POST. The System Error Log contains all the error messages that were issued during POST.

  To view the contents of the error logs, start the Configuration/Setup Utility program; then, select **Error Logs** from the main menu. See “Viewing the System Error log” on page 35 for more information.

- **ServerGuide error symptoms**

  ServerGuide error symptoms are explained at “ServerGuide error symptoms” on page 32.

- **SCSI error messages**

  For information on SCSI errors, see “Small computer system interface messages” on page 33 and “SCSI error codes” on page 153.

- **Diagnostic programs and error messages**

  The server diagnostic programs are stored in read-only memory (ROM) on the system board. These programs are the primary method of testing the major components of your server. See “Diagnostic programs and error messages” on page 33 for more information.

- **Light Path Diagnostics**

  Your server has light-emitting diodes (LEDs) to help you identify problems with server components. These LEDs are part of the Light Path Diagnostics that are built into your server. By following the path of LEDs, you can quickly identify the type of system error that occurred. See “Light Path Diagnostics” on page 38 for more information.

- **Error symptom charts**

  These charts list problem symptoms, along with suggested steps to correct the problems. See the “Error symptoms” on page 139 for more information.

- **Support**

  You can find service information for your IBM products, including supported options, at http://www.ibm.com/pc/support.

POST error logs

When you turn on the server, it performs a series of tests to check the operation of server components and some of the options installed in the server. This series of tests is called the power-on self-test, or POST.

If POST finishes without detecting any problems, a single beep sounds, and the first screen of your operating system or application program appears.

If POST detects a problem, more than one beep sounds, and an error message appears on your screen. See “Beep symptoms” on page 129 and “POST error codes” on page 147 for more information.

Notes:

1. If you have a power-on password or administrator password set, you must type the password and press Enter, when prompted, before POST will continue.
2. A single problem might cause several error messages. When this occurs, work to correct the cause of the first error message. After you correct the cause of the first error message, the other error messages usually will not occur the next time you run the test.

The POST error log contains the three most recent error codes and messages that the system generated during POST. The System Error log contains all messages issued during POST and all system status messages from the service processor.

You can view the contents of the System Error log from the Configuration/Setup Utility program or from the diagnostic programs.

Viewing error logs from the Configuration/Setup Utility program

Start the Configuration/Setup Utility program; then, select **Error Logs** from the main menu. See “Starting the Configuration/Setup Utility program” on page 15 for more information.

Viewing error logs from the diagnostic programs

Start the diagnostic programs; select **Hardware Info** from the top of the diagnostic programs screen; select **System Error Log** from the list that appears; then, follow the instructions on the screen. See “Starting the diagnostic programs” on page 34 for more information.

ServerGuide error symptoms

Look for the symptom in the left column of the chart. Probable solutions to the problem are in the right column.

Table 3. ServerGuide Setup and Installation CD

Symptom	Suggested action
The *ServerGuide Setup and Installation* CD will not start.	• Ensure that the server is supported and has a startable (bootable) CD-ROM drive. • If the startup (boot) sequence settings have been altered, ensure that the CD-ROM drive is first in the startup sequence. • If more than one CD-ROM drive is installed, ensure that only one drive is set as the primary drive. Start the CD from the primary drive.
The SCSI RAID program cannot view all installed drives, or the NOS cannot be installed.	• Ensure that there are no duplicate SCSI IDs or IRQ assignments. • Ensure that the hard disk drive is connected properly.
The Operating System Installation program continuously loops.	Make more space available on the hard disk.
The ServerGuide program will not start your NOS CD.	Ensure that the NOS CD you have is supported by the ServerGuide program. See the *ServerGuide Setup and Installation* CD label for a list of supported NOS versions.

Table 3. ServerGuide Setup and Installation CD (continued)

Symptom	Suggested action
The NOS cannot be installed; the option is not available.	Ensure that the NOS is supported on your server. If the NOS is supported, either there is no logical drive defined (SCSI RAID systems) or the ServerGuide System Partition is not present. Run the ServerGuide program, and ensure that setup is complete.

Small computer system interface messages

If you receive a SCSI error message, see “SCSI error codes” on page 153.

Note: If your server does not have a hard disk drive, ignore any message that indicates that the BIOS is not installed.

Diagnostic programs and error messages

The server diagnostic programs are stored in upgradeable read-only memory (ROM) on the system board. These programs are the primary method of testing the major components of your server.

Diagnostic error messages indicate that a problem exists; they are not intended to be used to identify a failing part. Troubleshooting and servicing of complex problems that are indicated by error messages should be performed by trained service personnel.

Sometimes the first error to occur causes additional errors. In this case, the server displays more than one error message. Always follow the suggested action instructions for the *first* error message that appears.

The following sections contain the error codes that might appear in the detailed test log and summary log when the diagnostic programs are run.

The error code format is as follows:

```
fff-ttt-iii-date-cc-text message
```

where:

fff is the three-digit function code that indicates the function being tested when the error occurred. For example, function code 089 is for the microprocessor.

ttt is the three-digit failure code that indicates the exact test failure that was encountered. (These codes are for trained service personnel; see “Diagnostic error codes” on page 134).

iii is the three-digit device ID. (These codes are for trained service personnel; see “Diagnostic error codes” on page 134).

date is the date that the diagnostic test was run and the error recorded.

cc is the check value that is used to verify the validity of the information.

text message is the diagnostic message that indicates the reason for the problem.

Text messages

The diagnostic text message format is as follows:

```
Function Name: Result (test specific string)
```

where:

Function Name
is the name of the function being tested when the error occurred. This corresponds to the function code (fff) shown in the error code format in the previous section.

Result
can be one of the following:

Passed	This result occurs when the diagnostic test is completed without any errors.
Failed	This result occurs when the diagnostic test discovers an error.
User Aborted	This result occurs when you stop the diagnostic test before it is complete.
Not Applicable	This result occurs when you specify a diagnostic test for a device that is not present.
Aborted	This result occurs when the test could not proceed, for example, because of the system configuration.
Warning	This result occurs when a possible problem is reported during the diagnostic test, such as when a device driver is not found.

test specific string
is additional information that you can use to analyze the problem.

Starting the diagnostic programs

Complete the following steps to start the diagnostic programs:

1. Turn on the server and watch the screen.

   Note: To run the diagnostic programs, you must start the server with the highest level password that is set. That is, if an administrator password is set, you must enter the administrator password, not the power-on password, to run the diagnostic programs.
2. When the message `F2 for Diagnostics` appears, press F2.
3. Type the appropriate password; then, press Enter.
4. Select either **Extended** or **Basic** from the top of the screen.
5. When the Diagnostic Programs screen appears, select the test you want to run from the list that appears; then, follow the instructions on the screen.

   Notes:

   a. You can press F1 while running the diagnostic programs to obtain help information. You also can press F1 from within a help screen to obtain online documentation from which you can select different categories. To exit from the help information and return to where you left off, press Esc.

b. If the server stops during testing and you cannot continue, restart the server and try running the diagnostic programs again. If the problem remains, replace the component that was being tested when the server stopped.

c. The keyboard and mouse (pointing device) tests assume that a keyboard and mouse are attached to the server.

d. If you run the diagnostic programs with either no mouse or a USB mouse attached to your server, you will not be able to navigate between test categories using the **Next Cat** and **Prev Cat** buttons. All other functions provided by mouse-selectable buttons are also available using the function keys.

e. You can test the USB keyboard by using the regular keyboard test. The regular mouse test can test a USB mouse. Also, you can run the USB interface test only if there are no USB devices attached.

f. You can view server configuration information (such as system configuration, memory contents, interrupt request (IRQ) use, direct memory access (DMA) use, device drivers, and so on) by selecting **Hardware Info** from the top of the screen.

If the diagnostic programs do not detect any hardware errors but the problem persists during normal server operations, a software error might be the cause. If you suspect a software problem, see the information that comes with the software package.

Viewing the test log

When the tests are completed, you can view the test log by selecting **Utility** from the top of the screen and then selecting **View Test Log**.

Notes:

1. You can view the test log only while you are in the diagnostic programs. When you exit the diagnostic programs, the test log is cleared (saved test logs are not affected). To save the test log so that you can view it later, click **Save Log** on the diagnostic programs screen and specify a location and name for the saved log file.
2. To save the test log to a diskette, you must use a diskette that you have formatted yourself; this function does not work with preformatted diskettes. If the diskette has sufficient space for the test log, the diskette may contain other data.

Viewing the System Error log

You can also view the System Error log from the diagnostic programs. See the instructions in “POST error logs” on page 31.

Diagnostic error message tables

For descriptions of the error messages that might appear when you run the diagnostic programs, see “Diagnostic error codes” on page 134.

Notes:

1. Depending on your server configuration, some of the error messages might not appear when you run the diagnostic programs.
2. If diagnostic error messages appear that are not listed in the tables, make sure that your server has the latest levels of BIOS, Advanced System Management Processor, ServeRAID, and diagnostics microcode installed.

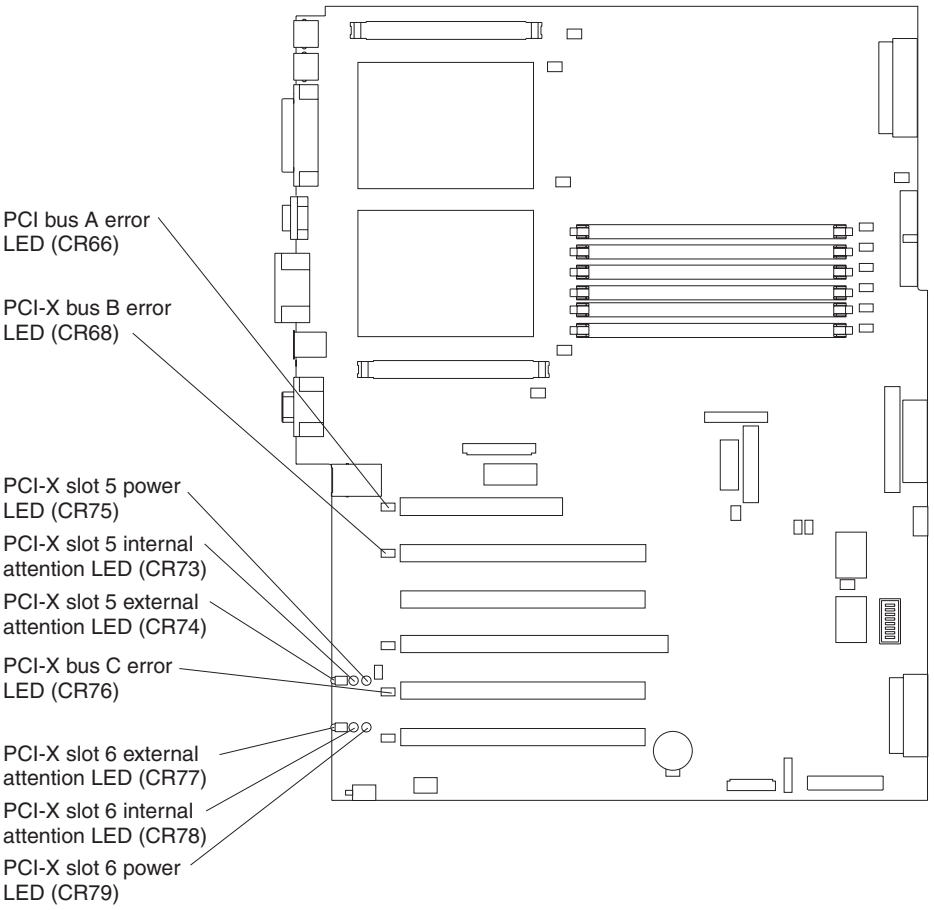
Identifying problems using status LEDs

If the system-error LED in the operator information panel on the front of the server is on, one or more LEDs inside the server or on the power supplies will be on. Your server has LEDs to help you identify problems with some server components. These LEDs are part of the Light Path Diagnostics feature built into the server. By following the path of LEDs, you can quickly identify the type of system error that occurred (see “Light Path Diagnostics” on page 38).

Your server is designed so that any LEDs that are illuminated remain illuminated when the server shuts down, provided that the ac power source is good and the power supplies can supply +5 V dc current to the server. This feature helps you isolate the problem if an error causes the server to shut down. See “System-board LED locations” on page 53.

LEDs for Active PCI slots

Each Active™ (hot-plug) PCI slot has three LEDs associated with it: one power LED and two attention LEDs. The following illustration shows the location of these LEDs.


PCI bus A error LED (CR66)
PCI-X bus B error LED (CR68)
PCI-X slot 5 power LED (CR75)
PCI-X slot 5 internal attention LED (CR73)
PCI-X slot 5 external attention LED (CR74)
PCI-X bus C error LED (CR76)
PCI-X slot 6 external attention LED (CR77)
PCI-X slot 6 internal attention LED (CR78)
PCI-X slot 6 power LED (CR79)

Power LED

This LED is on when the hot-plug PCI slot has power. An adapter must not be added to or removed from the PCI slot when the power LED is on.

When this LED is off, the hot-plug PCI slot has no power applied. An adapter can be added to or removed from the PCI slot when the power LED is off.

See your operating-system documentation to determine if your operating system supports hot-plug PCI adapters and, if so, how to disable the hot-plug PCI slot.

Attention LEDs

Each hot-plug PCI slot has an attention LED that is visible from the rear of the server and one that can be seen from inside the server. These LEDs have the same meaning; they are duplicated to be visible from outside or inside the server.

An attention LED flashes approximately once per second when it is on. The meaning of the attention LEDs is defined by your operating system. See your operating-system documentation to determine if your operating system supports hot-plug PCI adapters and, if so, what the attention LEDs indicate.

The following table describes the adapter power and attention LEDs.

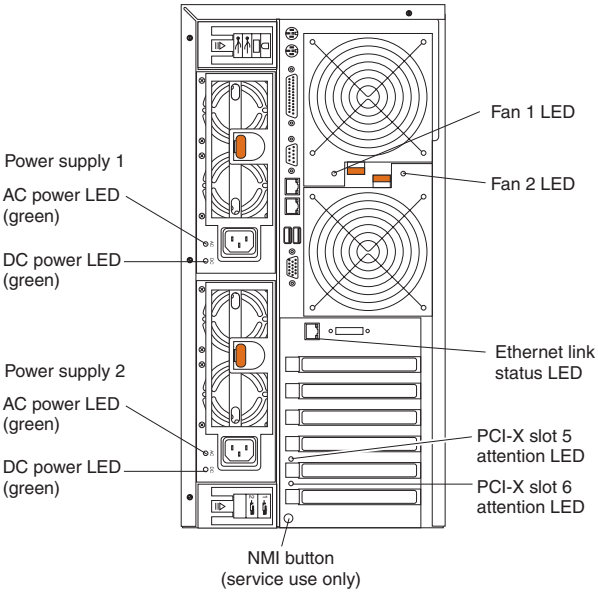
Table 4. Adapter power and attention LEDs

Power LED	Attention LED	Description and action
On	Flashing	The adapter requires attention. The slot still has power applied. Do not remove or install an adapter in the slot. See your operating-system documentation for instructions.
On	Off	Normal operation; no intervention is required.
Off	Flashing	The adapter requires intervention. Power is removed from the slot. An adapter can be removed or installed in the slot.
Off	Off	Power is removed from the slot. An adapter can be removed or installed in the slot.

Power-supply LEDs

The ac and dc power LEDs on the power supply provide status information about the power supply. The following illustration shows the location of the ac and dc power LEDs.

Note: The following illustration shows the rear of the server with two hot-swap power supplies installed. A server with a single fixed power supply is similar.



For more information about the ac and dc power LEDs, see “Power-supply LED errors” on page 146.

Light Path Diagnostics

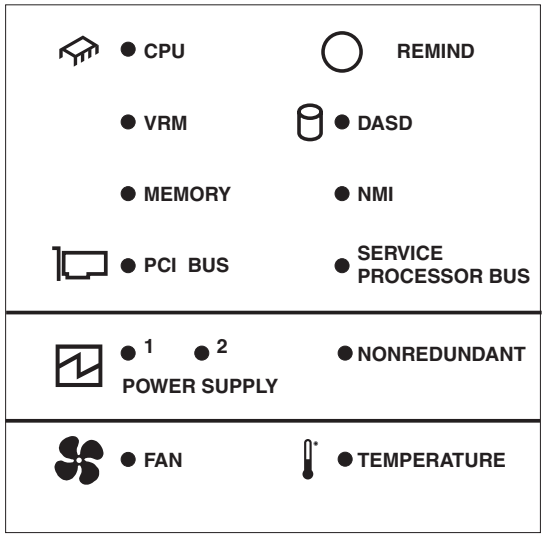
If the system error LED in the operator information panel on the front of the server is on, one or more LEDs inside the server might be on. Use the Light Path Diagnostics panel to quickly identify the type of error that occurred.

For LED locations, see “System-board LED locations” on page 53.

Your server is designed so that LEDs remain lit when the server shuts down, provided that the power supplies are operating properly. This feature helps you to isolate the problem even if an error causes the server to shut down.

Diagnostic panel LEDs

The following illustration shows the LEDs on the diagnostics panel inside the server.



The system-error LED on the operator information panel is lit when certain system errors occur. If the system-error LED on your server is lit, you can check the diagnostics panel to see if any LEDs are lit. You can determine the cause of the error and the action you should take by checking the table at “Diagnostic panel system error LED” on page 132.

Notes:

1. Depending on your server model, these items might appear in a different orientation on the LED panel.
2. The server supports a maximum of three PCI buses.
3. See the documentation that comes with the system-management software for more information about the service processor.

Remind button

You can use the Remind button to place the front panel system-error LED into the Remind mode. By pressing the button, you acknowledge the failure but indicate that you will not take immediate action. If a new failure occurs, the system-error LED will turn on again.

In the Remind mode, the system-error LED flashes every 2 seconds. The system-error LED remains in the Remind mode until one of the following situations occurs:

- All known problems are resolved
- The system is restarted
- A new problem occurs

You can use the Remind button to delay server maintenance until a later time. Also, resetting the system-error LED enables the LED to react to another error. If the LED is still on from the first error, it will not indicate additional errors. If you press the Remind button (causing the LED to flash every 2 seconds) and another error occurs, the LED will stop flashing and will instead be lit continuously to alert you to the new error.

Recovering the BIOS code

If the BIOS code has become damaged, such as from a power failure during a flash update, you can recover the BIOS code using a BIOS flash diskette.

Note: You can obtain a BIOS flash diskette from one of the following sources:

- Use the ServerGuide program to make a BIOS flash diskette.
- Download a BIOS flash diskette from the World Wide Web. Go to http://www.ibm.com/pc/support/, click **IBM Server Support**, and make the selections for your server.
- Contact your IBM service representative.

Complete the following steps to recover the BIOS code:

1. Turn off the server and disconnect all power cords and external cables; then, remove the server cover (see “Removing the left-side cover” on page 55).
2. Locate the boot block recovery jumper (J28) on the system board. See “System-board switches and jumpers” on page 51 for jumper location.
3. Remove the jumper from pins 1 and 2 of boot block recovery jumper and place it on pins 2 and 3 of the boot block recovery jumper to enable BIOS recovery mode.
4. Insert the BIOS flash diskette into the diskette drive.
5. Reconnect all power cords; then, reinstall the server cover.
6. Restart the server. The system begins the power-on self-test (POST).
7. Select **1 - Update POST/BIOS** from the menu that contains various flash (update) options.
8. When prompted as to whether you want to save the current code to a diskette, press N.
9. When prompted to choose a language, select a language (from 0 to 7) and press Enter to accept your choice.
10. Do not restart your server at this time.
11. Remove the BIOS flash diskette from the diskette drive.
12. Turn off the server and disconnect all power cords; then, remove the server cover.
13. Remove the jumper from pins 2 and 3 of boot block recovery jumper (J28) and place it on pins 1 and 2 of the boot block recovery jumper to return to normal startup mode.
14. Reconnect all external cables and power cords and turn on the peripheral devices; then, reinstall the server cover and restart the server. The system starts.

Power checkout

Power problems can be difficult to solve. For example, a short circuit can exist anywhere on any of the power distribution buses. Usually a short circuit will cause the power subsystem to shut down because of an overcurrent condition.

A general procedure for troubleshooting power problems is as follows:

1. Turn off the server and disconnect all ac power cords.
2. Check for loose cables in the power subsystem. Also check for short circuits, for example, if there is a loose screw causing a short circuit on a circuit board.

3. Remove adapters and disconnect the cables and power connectors to all internal and external devices until the server is at the minimum configuration required to start the server (see “Minimum operating requirements” on page 157).
4. Reconnect all ac power cords and turn on the server. If the server starts up successfully, replace adapters and devices one at a time until the problem is isolated. If the server does not start up from the minimal configuration, replace FRUs of minimal configuration one at a time until the problem is isolated.

To use this method, it is important to know the minimum configuration required for a system to start (see page 157). For specific problems, see “Power-supply LED errors” on page 146.

Troubleshooting the Ethernet controller

This section provides troubleshooting information for problems that might occur with the 10/100/1000 Mbps Ethernet controller.

Network connection problems

If the Ethernet controller cannot connect to the network, check the following conditions:

- Make sure that the cable is installed correctly.

  The network cable must be securely attached at all connections. If the cable is attached but the problem remains, try a different cable.

  If you set the Ethernet controller to operate at either 100 Mbps or 1000 Mbps, you must use Category 5 or higher cabling.
- Determine whether the hub supports auto-negotiation. If it does not, try configuring the integrated Ethernet controller manually to match the speed and duplex mode of the hub.
- Check the Ethernet controller LEDs on the operator information panel and on the rear of the server.

  These LEDs indicate whether a problem exists with the connector, cable, or hub.
  - The Ethernet transmit/receive activity LED, on the operator information panel, is lit when the Ethernet controller sends or receives data over the Ethernet Network. If the Ethernet transmit/receive activity LED is off, make sure that the hub and network are operating and that the correct device drivers are installed.
  - The Ethernet link status LED, on the rear of the server, is lit when the Ethernet controller receives a LINK pulse from the hub. If the LED is off, there might be a defective connector or cable or a problem with the hub.
- Make sure that you are using the correct device drivers which are supplied with your server.
- Check for operating-system-specific causes for the problem.
- Make sure that the device drivers on the client and server are using the same protocol.
- Test the Ethernet controller.

  The way the Ethernet controller is tested depends on which operating system you are using (see the Ethernet controller device driver README files).

Ethernet controller troubleshooting chart

Use the following troubleshooting chart to find solutions to 10/100/1000 Mbps Ethernet controller problems that have definite symptoms.

Table 5. Ethernet troubleshooting chart

Ethernet controller problem	FRU/actions
The server stops running when loading device drivers.	The PCI BIOS interrupt settings are incorrect. Check the following: • Determine if the interrupt (IRQ) setting assigned to the Ethernet controller is also assigned to another device in the Configuration/Setup Utility program. Although interrupt sharing is allowed for PCI devices, some devices do not function well when they share an interrupt with a dissimilar PCI device. Try changing the IRQ assigned to the Ethernet controller or the other device. For example, for NetWare Versions 3 and 4, it is recommended that disk controllers not share interrupts with LAN controllers. • Make sure that you are using the most recent device driver available from the World Wide Web. • Run the network diagnostic program. • Reseat or replace the adapter.
Ethernet link status LED does not work.	Check the following: • Make sure that the hub is turned on. • Check all connections at the Ethernet controller and the hub. • Use another port on the hub. • If the hub does not support auto-negotiation, manually configure the Ethernet controller to match the hub. • If you manually configured the Duplex mode, make sure that you also manually configure the speed. • Run diagnostics on the LEDs. • Reseat or replace the adapter.
The Ethernet transmit/receive activity LED does not work.	Check the following: • Make sure that you have loaded the network device drivers. • The network might be idle. Try sending data from this server. • Run diagnostics on the LEDs.
Data is incorrect or sporadic.	Check the following: • Make sure that you are using Category 5 or higher cabling when operating the server at 100 Mbps or at 1000 Mbps. • Make sure that the cables do not run close to noise-inducing sources like fluorescent lights.
The Ethernet controller stopped working when another adapter was added to the server.	Check the following: • Make sure that the cable is connected to the Ethernet controller. • Make sure that your PCI system BIOS code is current. • Reseat the adapter. • Determine if the interrupt (IRQ) setting assigned to the Ethernet adapter is also assigned to another device in the system. Use the Configuration/Setup Utility program to determine if this is the case. Although interrupt sharing is allowed for PCI devices, some devices do not function well when they share an interrupt with a dissimilar PCI device. Try changing the IRQ assigned to the Ethernet adapter or the other device. • Reseat or replace the adapter.
The Ethernet controller stopped working without apparent cause.	Check the following: • Run diagnostics for the Ethernet controller. • Try a different connector on the hub. • Reinstall the device drivers. See your operating-system documentation and the ServerGuide information. • Reseat or replace the adapter.

Ethernet controller messages

The integrated Ethernet controller might display messages from certain device drivers. The latest information available concerning these messages will be made available at the IBM Support Web site at http://www.ibm.com/pc/support.

Chapter 4. Customer replaceable units

This chapter provides instructions for adding options to your server. Some option-removal instructions are provided in case you need to remove one option to install another.

Installation guidelines

Before you begin to install options in your server, read the following information:

- Become familiar with the safety and handling guidelines specified under "Handling static-sensitive devices" on page 46 and read the safety statements in "Safety information" on page 169.
- You do not need to turn off the server to install or replace hot-swap power supplies, hot-swap drives, hot-swap fans, Active PCI (hot-plug) adapters, or hot-plug Universal Serial Bus (USB) devices.
- The orange color on components and labels in your server identifies hot-swap or hot-plug component. You can install or remove hot-swap and hot-plug components while the system is running, provided that your system is configured to support this function. For complete details about installing or removing a hot-swap or hot-plug component, see the detailed information in this chapter.
- The blue color on components and labels identifies touch points where you can grip a component, move a latch, and so on.
- Make sure that you have an adequate number of properly grounded electrical outlets for your server, monitor, and any other options that you intend to install.
- Back up all important data before you make changes to disk drives.
- For a list of supported options for your server, go to http://www.ibm.com/pc/us/compat/ on the World Wide Web.

System reliability considerations

To help ensure proper cooling and system reliability, make sure that:

- Each of the drive bays has either a drive or a filler panel installed.
- Each of the power-supply bays has a power supply installed.
- For tower models, make sure that there is at least 50 mm (2 inches) of ventilated space at the sides of the server and 100 mm (4 inches) at the front and rear of the server.

  For rack configurations, make sure that space is available around the server to enable the server cooling system to work properly. See the documentation that comes with the rack for additional information.
- The server cover is in place during normal operation.
- The air-baffle cover over the microprocessors remains closed during normal operation.
- A removed hot-swap drive is replaced within 2 minutes of removal.
- Cables for optional adapters are routed according to the instructions provided with the adapters.
- A failed fan is replaced within 48 hours.
- The server is turned off and the power cords are disconnected before you open the air-baffle cover.
- The air-baffle assembly is always installed in the server except when you are installing or removing the components that are located under the air-baffle cover.

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- When the air-baffle assembly is installed in the server, the air-baffle cover is always closed.
- Microprocessor socket 2 always contains either a microprocessor baffle or a microprocessor.

Working inside the server with the power on

Your server supports hot-plug, hot-add, and hot-swap devices and is designed to operate safely while turned on with the cover removed. Follow these guidelines when you work inside a server that is turned on:

- Avoid loose-fitting clothing on your forearms. Button long-sleeved shirts before working inside the server; do not wear cuff links while you are working inside the server.
- Do not allow your necktie or scarf to hang inside the server.
- Remove jewelry, such as bracelets, necklaces, rings, and loose-fitting wrist watches.
- Remove items from your shirt pocket (such as pens or pencils) that could fall into the server as you lean over it.
- Avoid dropping any metallic objects, such as paper clips, hair pins, or screws, into the server.

Handling static-sensitive devices

Attention: Static electricity can damage electronic devices and your system. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

To reduce the possibility of electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the server for at least 2 seconds. (This drains static electricity from the package and from your body.)
- Remove the device from its package and install it directly into the server without setting down the device. If it is necessary to set down the device, place it back into its static-protective package. Do not place the device on the server cover or on a metal surface.
- Take additional care when handling devices during cold weather because heating reduces indoor humidity and increases static electricity.

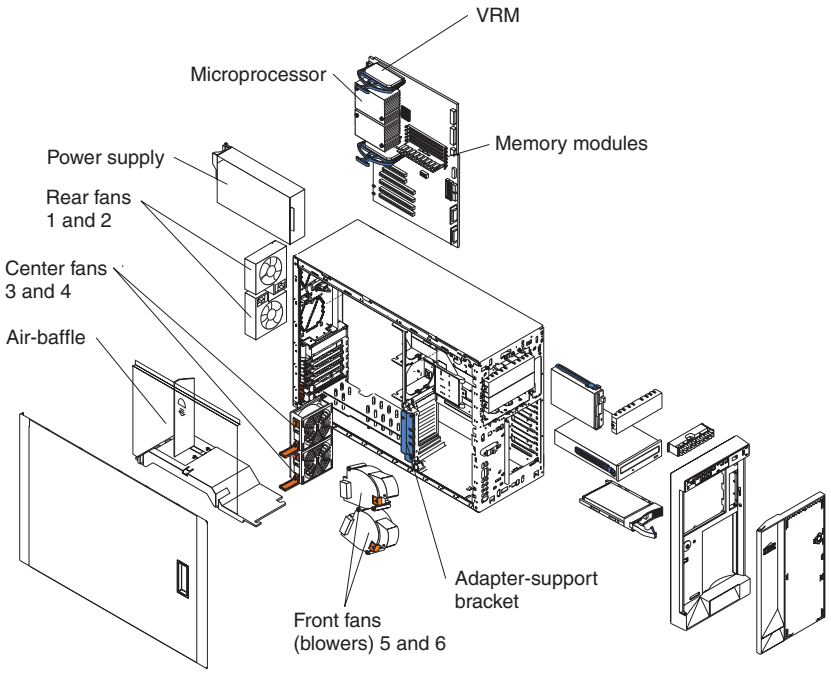
Major components of the xSeries 235 Type 8671 server

The orange color on components and labels in your server identifies hot-swap or hot-plug components. You can install or remove hot-swap or hot-plug components while the system is running, provided that your system is configured to support this function.

The blue color on components and labels indicates touch points where a component can be gripped, a latch moved, and so on.

The following illustration shows the major components in your server.

Note: The illustrations in this document might differ slightly from your hardware.

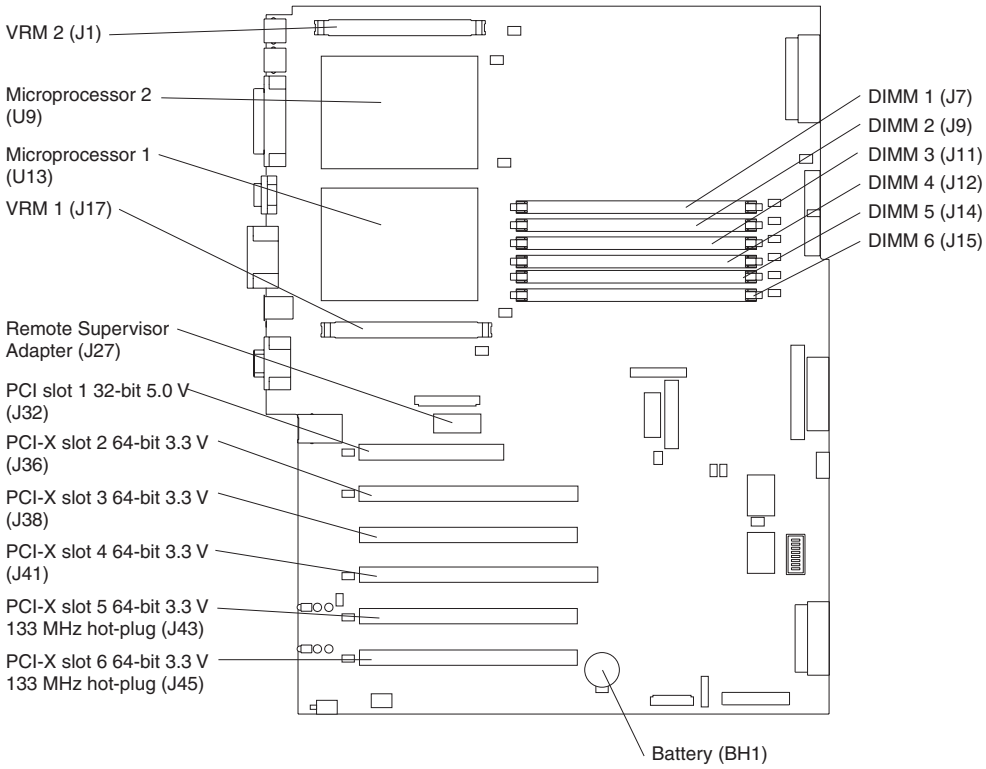


System-board component locations

This section provides illustrations of the system board showing the locations of connectors, switch and jumper blocks, and LEDs.

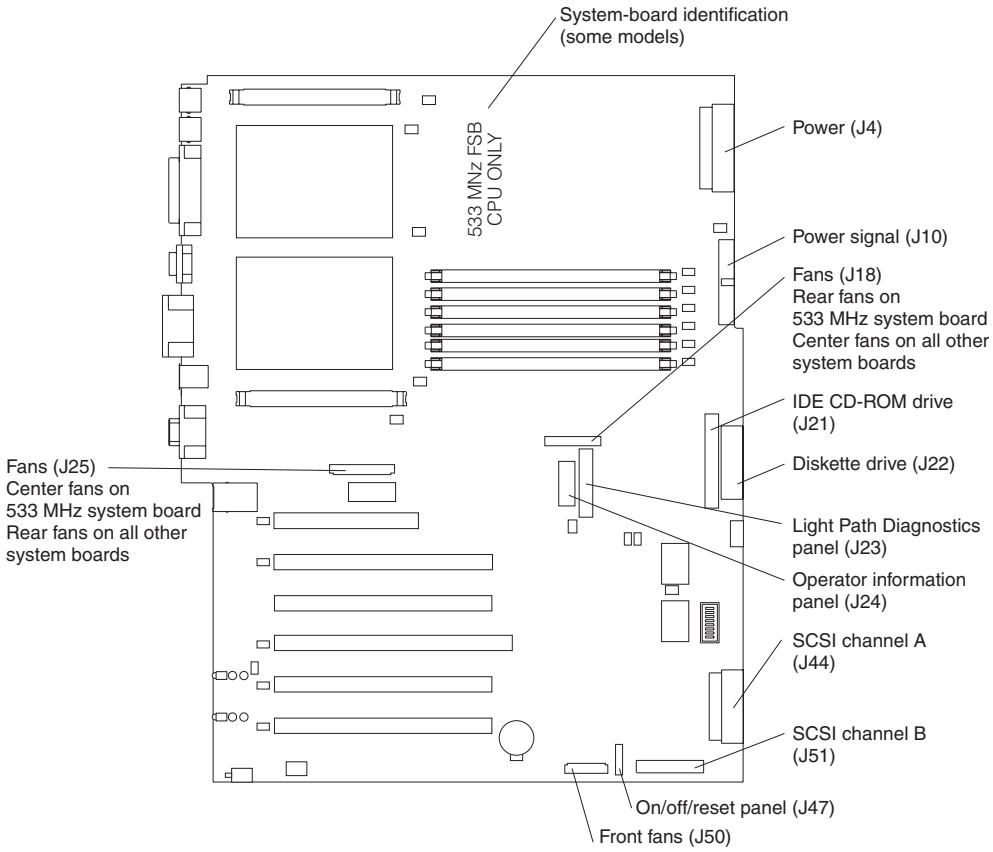
System-board option connectors

The following illustration shows the location of the system-board connectors for user-installable options.


VRM 2 (J1)
Microprocessor 2 (U9)
Microprocessor 1 (U13)
VRM 1 (J17)
Remote Supervisor Adapter (J27)
PCI slot 1 32-bit 5.0 V (J32)
PCI-X slot 2 64-bit 3.3 V (J36)
PCI-X slot 3 64-bit 3.3 V (J38)
PCI-X slot 4 64-bit 3.3 V (J41)
PCI-X slot 5 64-bit 3.3 V 133 MHz hot-plug (J43)
PCI-X slot 6 64-bit 3.3 V 133 MHz hot-plug (J45)
DIMM 1 (J7)
DIMM 2 (J9)
DIMM 3 (J11)
DIMM 4 (J12)
DIMM 5 (J14)
DIMM 6 (J15)
Battery (BH1)

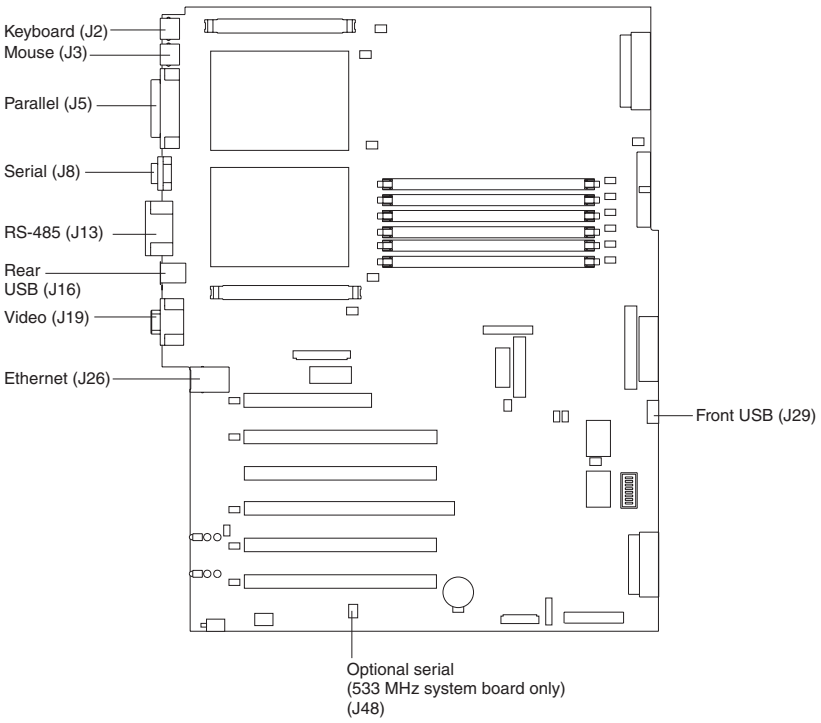
System-board internal cable connectors

The following illustration shows the internal cable connectors on the system board.



System-board external port connectors

The following illustration shows the location of the input/output external port connectors on the system board.



System-board switches and jumpers

The following illustration shows the location of the system-board switch block (SW1) and jumper blocks (J28 and J42) on the system board.

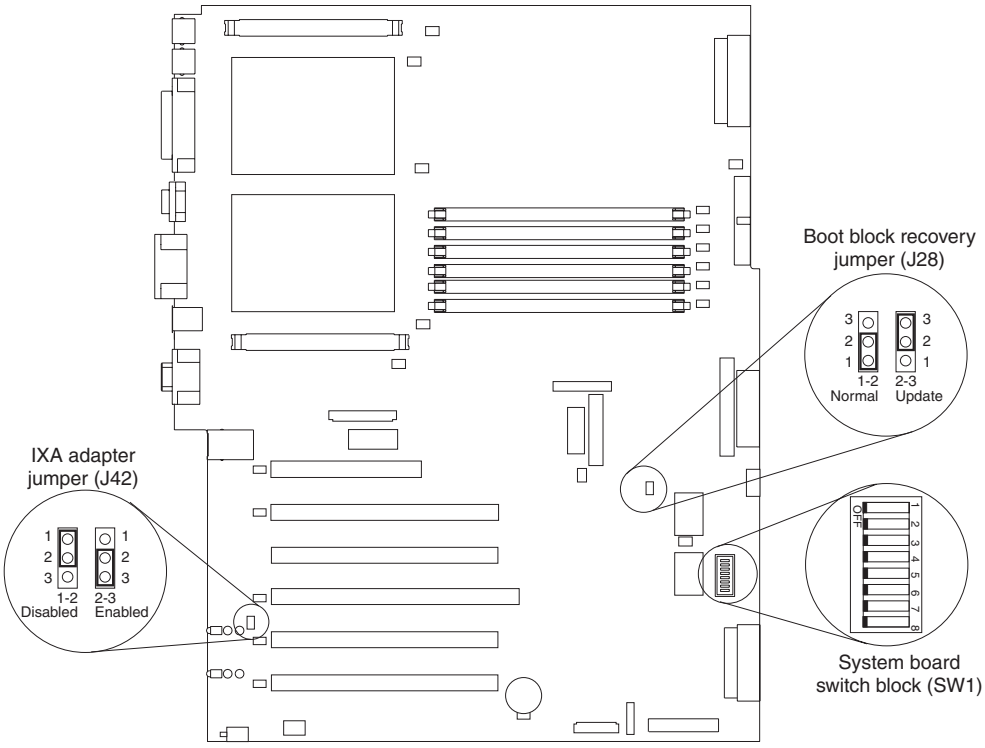


Table 6 describes the function of each switch on the switch block.

Table 6. Switches 1-8

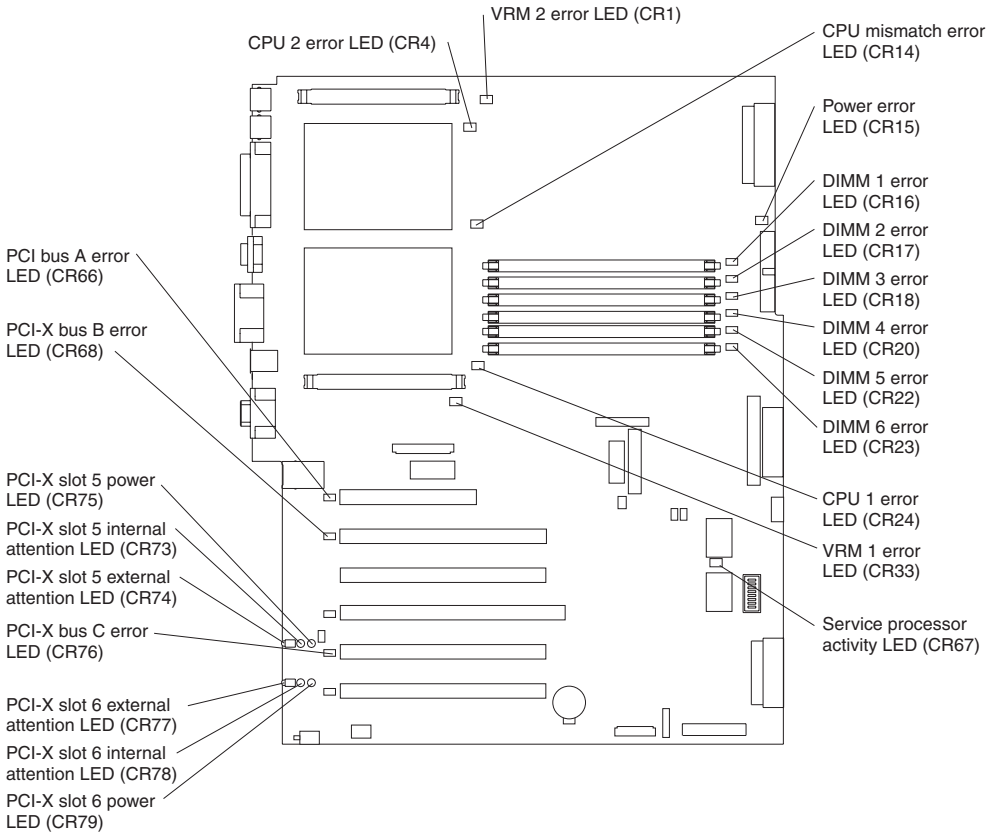
Switch number	Default value	Switch description
8	Off	400 MHz system board - Reserved. 533 MHz system board - Disable Wake on LAN after ac power-on.
7	Off	Power-on override. When toggled to On, this switch forces the server to turn on, overriding the power-on button.
6	Off	Power-on password override. Changing the position of this switch bypasses the power-on password check the next time the server is turned on and starts the Configuration/Setup Utility program so that you can change or delete the power-on password. You do not need to move the switch back to the default position after the password is overridden. Changing the position of this switch does not affect the administrator password check if an administrator password is set. See “Choices available from the Configuration/Setup main menu” on page 16 for additional information about the power-on password.
5	Off	Reserved.
4	Off	Reserved.
3	Off	Reserved.
2	Off	Reserved.
1	Off	Reserved.

CAUTION:
Before changing any switch settings or moving any jumpers, turn off the server; then, disconnect all power cords and external cables. (Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.)

Note: Any system-board switch or jumper blocks that are not shown in the illustrations in this book are reserved.

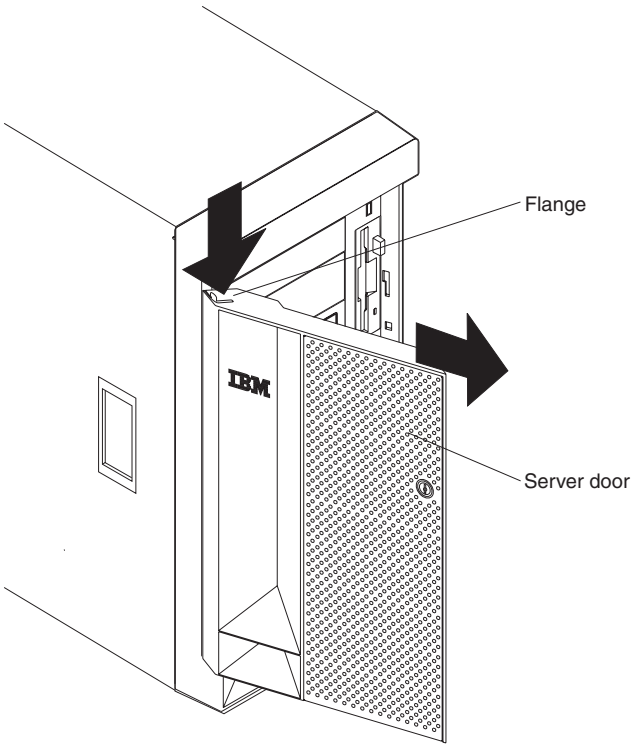
System-board LED locations

The following illustration shows the location of the LEDs on the system board. You might need to refer to this illustration when solving server problems.


VRM 2 error LED (CR1)
CPU 2 error LED (CR4)
CPU mismatch error LED (CR14)
Power error LED (CR15)
DIMM 1 error LED (CR16)
DIMM 2 error LED (CR17)
DIMM 3 error LED (CR18)
DIMM 4 error LED (CR20)
DIMM 5 error LED (CR22)
DIMM 6 error LED (CR23)
PCI bus A error LED (CR66)
PCI-X bus B error LED (CR68)
PCI-X slot 5 power LED (CR75)
PCI-X slot 5 internal attention LED (CR73)
PCI-X slot 5 external attention LED (CR74)
PCI-X bus C error LED (CR76)
PCI-X slot 6 external attention LED (CR77)
PCI-X slot 6 internal attention LED (CR78)
PCI-X slot 6 power LED (CR79)
CPU 1 error LED (CR24)
VRM 1 error LED (CR33)
Service processor activity LED (CR67)

Removing the server door (tower model)

The following illustration shows how to remove the door from the tower model server.



Complete the following steps to remove the server door:

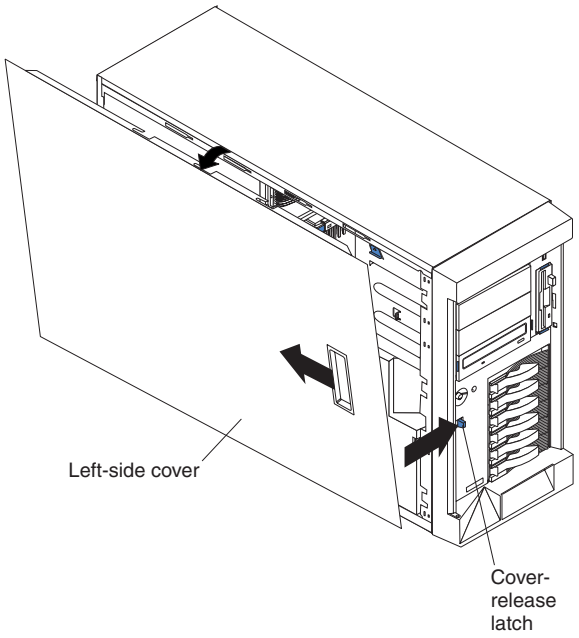
1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Unlock and open the server door.
3. Locate the flange on the top edge of the door.
4. Press the flange downward while pressing outward on the door; then, lift the door up and off the hinge. Set the door aside in a safe place.

Removing the server left-side cover and bezel (tower model)

This section describes how to remove the left-side cover and bezel from the tower model server.

Removing the left-side cover

The following illustration shows how to remove the left-side cover from the tower model server.



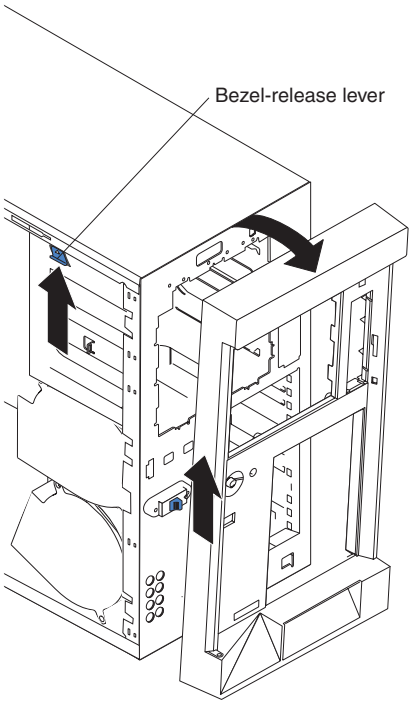
Complete the following steps to remove the server left-side cover:

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Push the plastic cover-release latch on the front of the server to the right to release the cover.
3. While pushing the plastic cover-release latch, slide the left-side cover slightly toward the rear of the server; the cover will stop after approximately 25 mm (1 inch). Release the cover-release latch; then, lift the cover off the server and set the cover aside.

Removing the bezel

The following illustration shows how to remove the bezel from the tower model server.

Note: If you have not already removed the door, remove it as described in "Removing the server door (tower model)" on page 54.



Complete the following steps to remove the bezel:

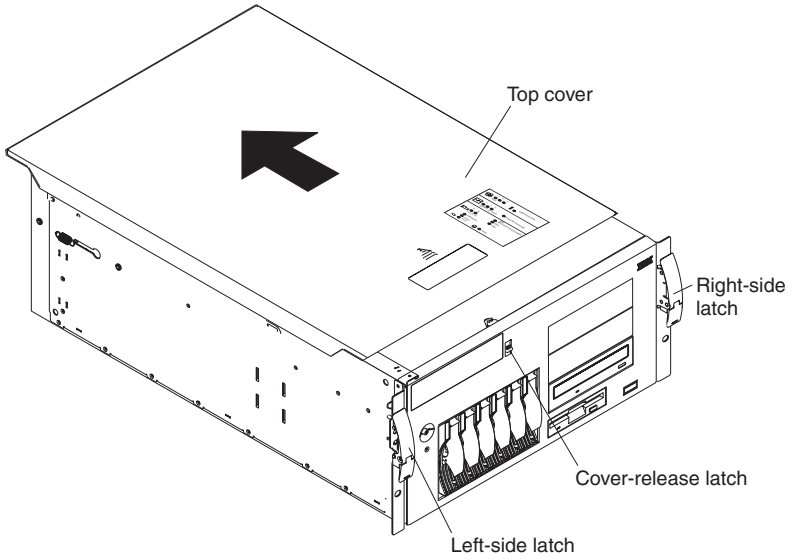
1. Review the information in "Installation guidelines" on page 45, "Handling static-sensitive devices" on page 46, and "Safety information" on page 169.
2. Press up on the bezel-release lever.
3. Pull the top of the bezel away from the chassis; then, lift the bezel to disengage the bottom tabs.
4. Remove the bezel from the server and store the bezel in a safe place.

Removing the server top cover and bezel (rack configuration)

This section describes how to remove the top cover and bezel from a rack configuration server.

Removing the top cover

The following illustration shows how to remove the top cover from a rack configuration server.

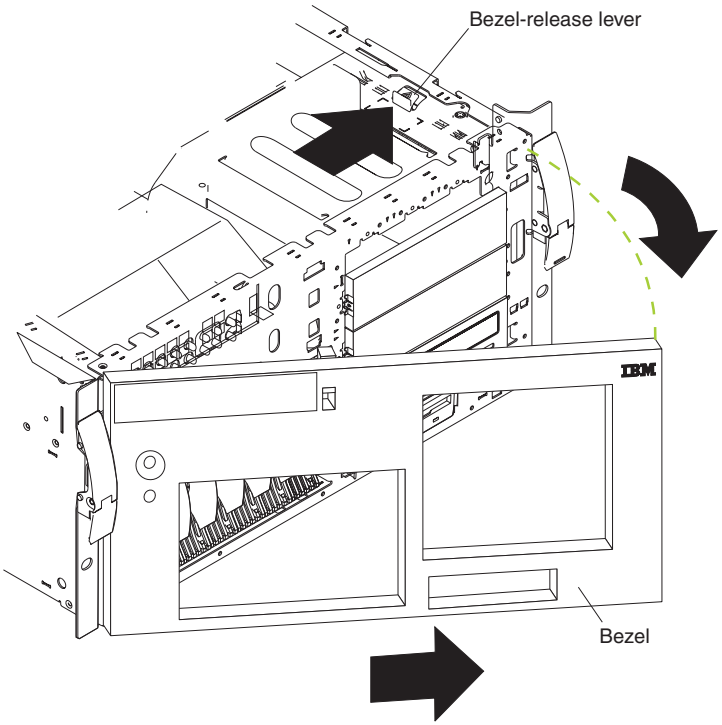


Complete the following steps to remove the server top cover:

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Press down on the plastic cover-release latch on the front of the server.
3. While pressing the plastic cover-release latch, slide the top cover slightly toward the rear of the server; the cover will stop after approximately 25 mm (1 inch). Release the cover-release latch; then, lift the cover off the server and set the cover aside.

Removing the bezel

The following illustration shows how to remove the bezel from a rack configuration server.



Complete the following steps to remove the bezel:

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Remove the server cover and locate the bezel-release lever.
3. Press the bezel-release lever to the unlocked position as indicated on the lever.
4. Pull the right side of the bezel away from the chassis; then, slide the bezel to the right to disengage the tabs.
5. Remove the bezel from the server and store the bezel in a safe place.

Removing and installing the adapter-support bracket

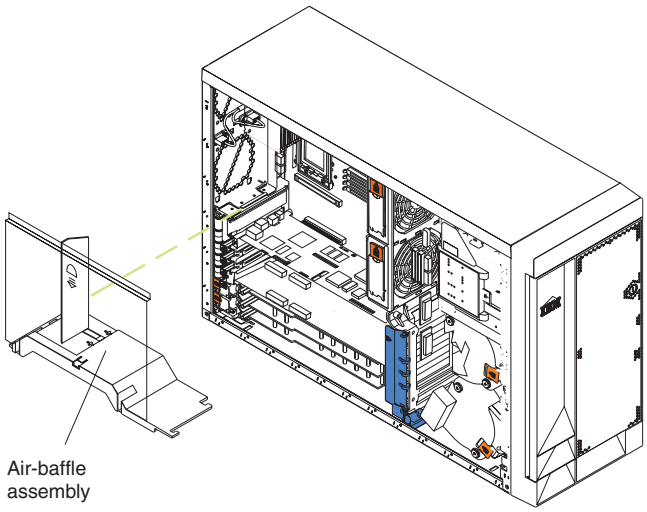
When working with some options, you must first remove the adapter-support bracket to access certain components or connectors on the system board.

Note: The adapter-support bracket is attached to the center-fan bracket in the server. Both brackets are removed and installed together as a single unit.

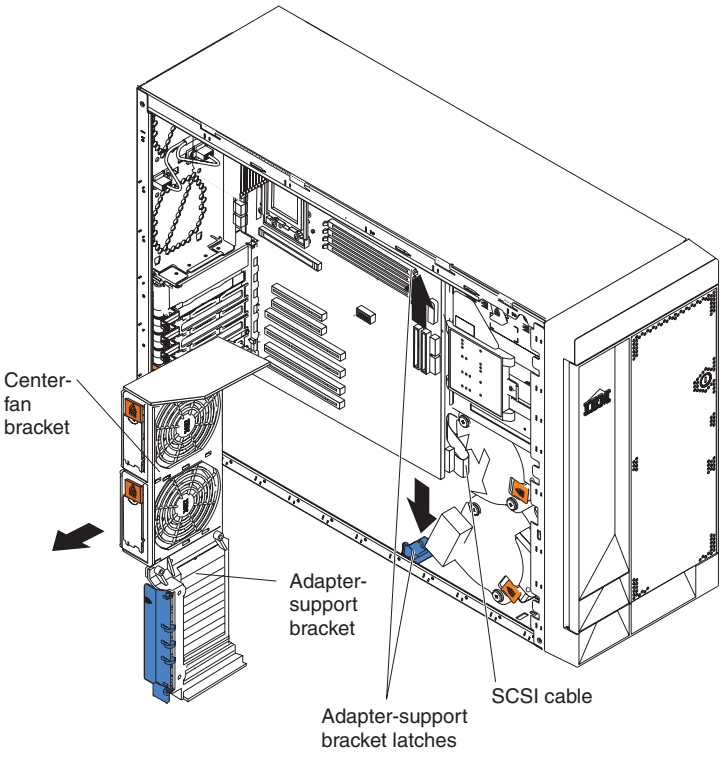
Complete the following steps to remove the adapter-support bracket:

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.

2. Turn off the server and disconnect all power cords and external cables (“Turning off the server” on page 9); then, remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 55 or “Removing the server top cover and bezel (rack configuration)” on page 57).
3. Slide the air-baffle assembly out of the guides; then, remove it from the server.



4. Disconnect any cables that are connected to the full-length adapters.
5. Lift the adapter-retention clip on top of the adapter-support bracket (for the location of this clip, see the illustration at “Installing a hot-plug adapter (slots 5 and 6)” on page 62); then, remove the full-length adapters and plastic dividers.
6. Disconnect the end of the cable that is attached to the center-fans connector on the system board (see “System-board internal cable connectors” on page 49).
7. Remove the adapter-support bracket.



a. Press the release tab on each adapter-support bracket latch. There are two latches; one at each end of the adapter-support bracket.
b. Slide the adapter-support bracket and fan-support bracket unit out of the guides; then, remove it from the server.

Note: To reinstall the adapter-support bracket and other components that you removed or disconnected, reverse the preceding steps. Remember to reroute the cables that you disconnected and to reconnect the center-fan cable to the system board (see “System-board internal cable connectors” on page 49).

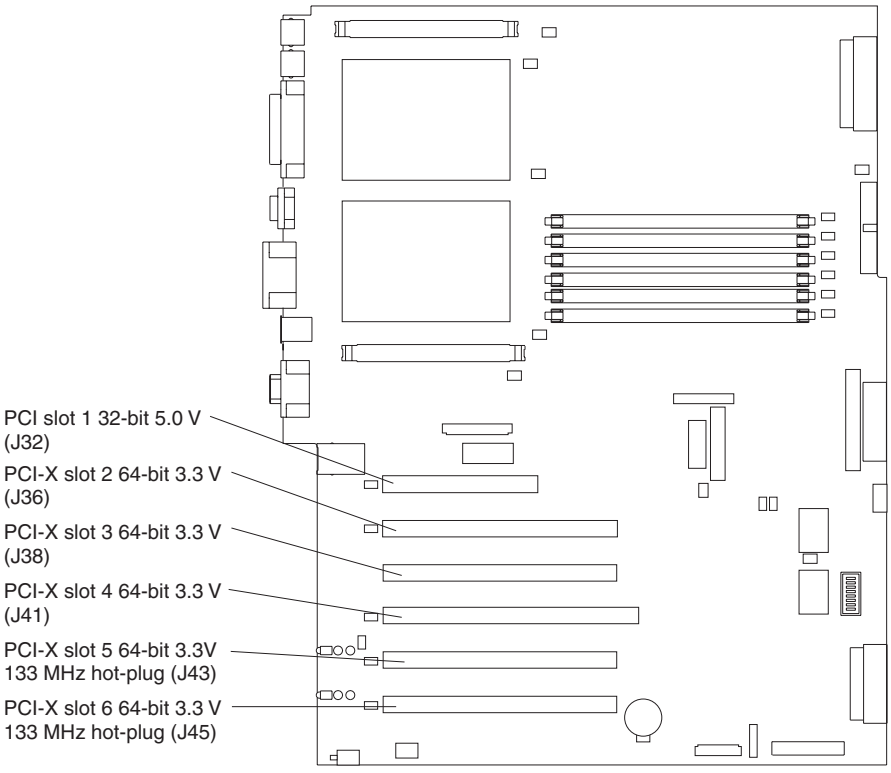
8. Continue with the option installation or removal procedure.

Working with adapters

This section describes how to install hot-plug and non-hot-plug PCI and PCI-X adapters. Before you continue with the adapter-installation procedures, review “Adapter considerations”.

The following illustration shows the location of the PCI and PCI-X adapter expansion slots on the system board. Slots 5 and 6 are the Active PCI-X™ slots. Active PCI-X slots are also called hot-plug PCI-X slots.

Note: For information about the adapter power-on and attention LEDs, see “LEDs for Active PCI slots” on page 36.


PCI slot 1 32-bit 5.0 V (J32)
PCI-X slot 2 64-bit 3.3 V (J36)
PCI-X slot 3 64-bit 3.3 V (J38)
PCI-X slot 4 64-bit 3.3 V (J41)
PCI-X slot 5 64-bit 3.3V 133 MHz hot-plug (J43)
PCI-X slot 6 64-bit 3.3 V 133 MHz hot-plug (J45)

Adapter considerations

Before you install an adapter, review the following:

- Read the documentation that comes with your operating system.

- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this chapter. If you need to change the switch or jumper settings on your adapter, follow the instructions that come with the adapter.
- You can install full-length adapters and non-hot-plug adapters in any expansion slot.
- The 32-bit PCI slot supports 5.0 V signaling PCI adapters; it does not support 3.3 V signaling adapters.
- The 64-bit PCI-X slots 2 through 6 support 3.3 V signaling PCI or PCI-X adapters; they do not support 5.0 V signaling adapters.
- The PCI bus configuration is:
  - Non-hot-plug, 32-bit PCI slot 1 is on PCI bus A, 33 MHz
  - Non-hot-plug, 64-bit PCI-X slots 2 and 3, and the integrated Ethernet controller, are on PCI bus B, 100 MHz (independent of slot 4)
  - Non-hot-plug, 64-bit PCI-X slot 4 and the integrated SCSI controller with RAID capabilities are on PCI bus B, 100 MHz (independent of slots 2 and 3)
  - Hot-plug, 64-bit PCI-X slot 5 is on PCI bus C, 133 MHz (independent of slot 6)
  - Hot-plug, 64-bit PCI-X slot 6 is on PCI bus C, 133 MHz (independent of slot 5)

  Notes:

  1. PCI bus A is often referred to as bus 0; PCI bus B is often referred to as bus 1 and bus 2; and PCI bus C is often referred to as bus 3 and bus 5. However, the bus numbers vary according to the adapters that are installed.
  2. If an optional ServeRAID-5i controller is installed, it overrides the standard functionality of the integrated SCSI controller with RAID capabilities and forces PCI-X slot 4 to 66 MHz. The ServeRAID-5i controller must be installed in slot 4 using the 3-U bracket that comes with the controller. However, if a ServeRAID-5i controller is installed and later removed, you must re-enable the on-board SCSI controller in using the Configuration/Setup Utility program (see “Starting the Configuration/Setup Utility program” on page 15).
  3. The integrated SCSI controller with RAID capabilities is on PCI bus B.
- The optional IBM Remote Supervisor Adapter must be installed in PCI slot 1 only. Use the ribbon cable that comes with the adapter to connect the adapter to the Remote Supervisor Adapter connector (J27) on the system board.
- The system scans PCI and PCI-X slots 1 through 6 to assign system resources. The system then starts (boots) the system devices in the following order, if you have not changed the default boot precedence: integrated SCSI controller with RAID capabilities (or optional ServeRAID-5i controller), integrated Ethernet controller, and then PCI and PCI-X slots 1 through 6.

  Note: To change the boot precedence for PCI and PCI-X devices, start the Configuration/Setup Utility program and select **Start Options** from the main menu (see “Starting the Configuration/Setup Utility program” on page 15).
- The Active PCI-X slots contain:
  - Power-on LEDs
  - Internal attention LEDs
  - External attention LEDs

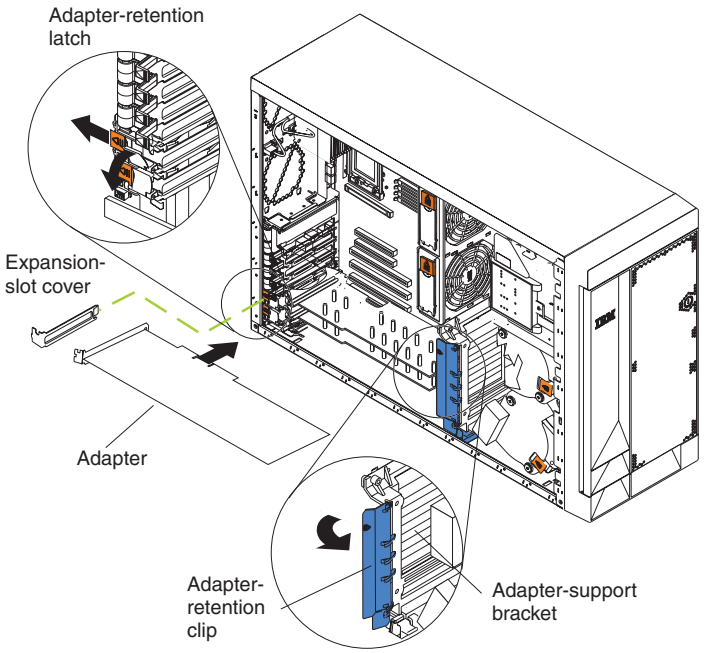
Installing a hot-plug adapter (slots 5 and 6)

This section contains the procedure for installing a hot-plug PCI or PCI-X adapter. If your operating system supports hot-plug PCI or PCI-X adapters, you can replace a failing hot-plug PCI or PCI-X adapter with a new adapter of the same type without turning off power to the server. If your operating system and adapter also support the hot-add feature, you can install a new adapter without turning off the power to the server.

Notes:

1. Although an optional Integrated xSeries Adapter (IXA) can be installed only in slots 5 and 6, it is not a hot-plug adapter. See “Installing a non-hot-plug adapter (any slot)” on page 64 for instructions for installing an IXA adapter.
2. Do not remove a hot-plug adapter before performing the operating-system-defined procedure for disabling the Active PCI-X (hot-plug) slot that contains the adapter. Failure to do so might cause your system to lock up. See your operating-system documentation for additional information.
3. You do not have to turn off the server to install hot-plug adapters in the hot-plug slots. However, you must turn off the server when performing any steps that involve installing or removing cables.

The following illustration shows how to install a PCI or PCI-X hot-plug adapter.



Complete the following steps to install a hot-plug PCI or PCI-X adapter:

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. If you are installing an adapter that requires you to install or remove any cables, turn off the server and disconnect all power cords and external cables (“Turning off the server” on page 9).
3. Remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 55 or “Removing the server top cover and bezel (rack configuration)” on page 57).
4. Determine which expansion slot you will use for the adapter.

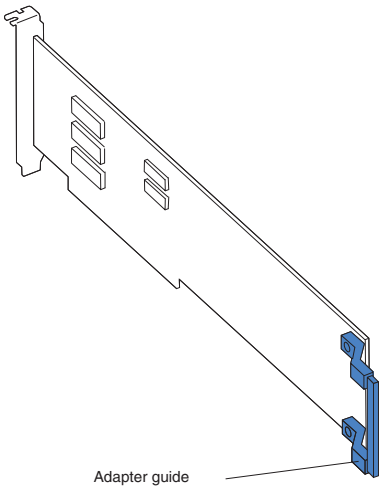
Note: Only PCI-X slots 5 and 6 support hot-plug adapters.

Attention: Disabling a PCI-X slot turns off the power LED for that PCI-X slot. Make sure that the power LED for the hot-plug PCI-X slot is off before you continue with the next step. See “System-board LED locations” on page 53 for the location of the power LED.

5. Disable the selected PCI-X slot from your operating system. (See the documentation that comes with your operating system for information about disabling a hot-plug PCI-X slot.)
6. Slide the orange adapter-retention-latch release toward the rear of the server and hold it there while you lift the black adapter-retention latch to the unlocked (open) position as indicated by the arrow.

   Attention: Expansion-slot covers must be installed on all empty slots. This maintains the electronic emissions characteristics of the system and ensures proper cooling of system components.
7. Remove the expansion-slot cover from the server. Store it in a safe place for future use.
8. If you are installing a full-length adapter, lift the adapter-retention clip on the adapter-support bracket. Otherwise, continue with the next step.
9. See the documentation that comes with your adapter for any cabling instructions. It might be easier for you to route cables before you install the adapter.

   Attention: Avoid touching the components and gold-edge connectors on the adapter.
10. Remove the adapter from the static-protective package.
11. Install the adapter:
    a. If you are installing a full-length adapter, remove the blue adapter guide (if any) from the end of the adapter.



    b. Carefully grasp the adapter by its top edge or upper corners, and align it with the expansion slot on the system board.

       Attention: When you install an adapter in the server, be sure that it is completely and correctly seated in the system-board connector. Incomplete insertion might cause damage to the system board or the adapter.
    c. Press the adapter *firmly* into the expansion slot.
    d. Lower the adapter-retention latch over the top corner of the adapter. The adapter-retention latch automatically locks into place.

Important: Power cannot be restored to the adapter slot if the latch is not lowered into place.

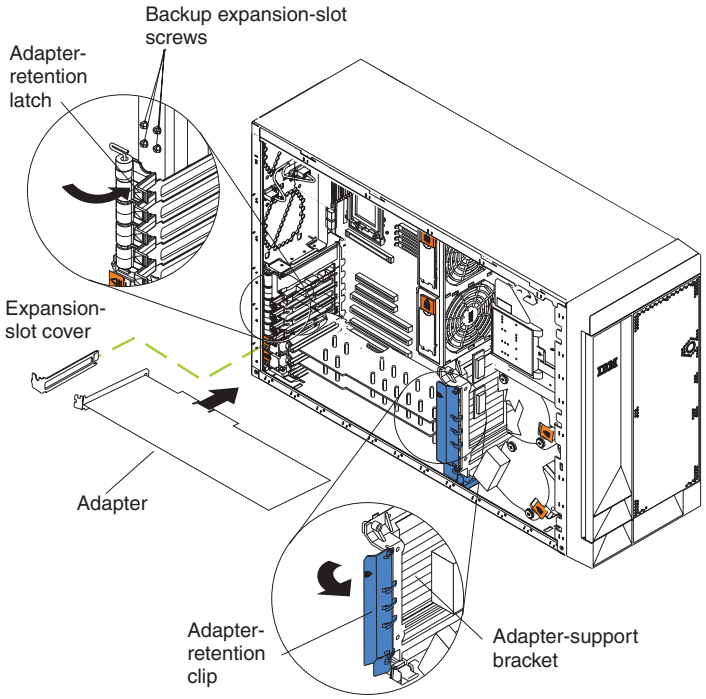
12. If you installed a full-length adapter, close the adapter-retention clip on the adapter-support bracket. Otherwise, continue with the next step.

    Attention: When you route the cables, do not block the ventilated space around any of the fans.

13. Connect any needed cables to the adapter.
14. Enable the hot-plug PCI-X slot from your operating system. When the hot-plug PCI-X slot is enabled, the power LED for that hot-plug PCI-X slot comes on. See the documentation that comes with your operating system for information about enabling a hot-plug PCI-X slot.
15. If you have other options to install or remove, do so now; otherwise, go to “Installing the server bezel and left-side cover (tower model)” on page 100 or “Installing the server bezel and top cover (rack configuration)” on page 103.

Installing a non-hot-plug adapter (any slot)

The following illustration shows how to install a non-hot-plug PCI or PCI-X adapter.



Attention: You must install the IXA adapter jumper (J42) between pins 2 and 3 when using an Integrated xSeries Adapter (IXA) in slots 5 and 6 (see “System-board switches and jumpers” on page 51).

Notes:

1. Although an optional IXA adapter is not a hot-plug adapter, it can be installed only in slots 5 and 6. It is a double width adapter that installs in slot 5 and spans slots 5 and 6.
2. You can install an optional ServeRAID-5i controller only in PCI-X slot 4. Slot 4 is the only PCI-X slot that supports the ServeRAID-5i controller requirements. Install the ServeRAID-5i controller using the 3-U bracket that comes with the controller. However, if a ServeRAID-5i controller is installed and later removed,

you must re-enable the on-board SCSI controller in using the Configuration/Setup Utility program (see “Starting the Configuration/Setup Utility program” on page 15).

Complete the following steps to install a non-hot-plug PCI or PCI-X adapter:

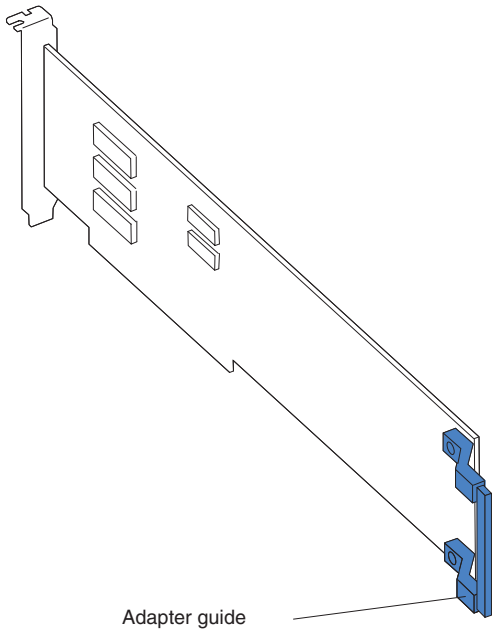
1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Turn off the server and disconnect all power cords and external cables (“Turning off the server” on page 9); then, remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 55 or “Removing the server top cover and bezel (rack configuration)” on page 57).
3. Determine which expansion slot you will use for the adapter.
4. If you are installing an adapter in PCI slot 1 or PCI-X slots 2 through 4, lift the tab on the expansion-slot cover. Continue with the next step.

   If you are installing an adapter in PCI-X slot 5 or 6, slide the adapter-retention-latch release toward the rear of the server and hold it there while you lift the adapter-retention latch to the unlocked (open) position, as shown in the illustration at “Installing a hot-plug adapter (slots 5 and 6)” on page 62.

   Attention: Expansion-slot covers must be installed on all empty slots. This maintains the electronic emissions characteristics of the system and ensures proper cooling of system components.
5. Remove the expansion-slot cover from the server. Store it in a safe place for future use.
6. If you are installing an IXA adapter in slot 5 and 6, make sure that the IXA adapter jumper (J42) is installed between pins 2 and 3; otherwise, make sure it is installed between pins 1 and 2. (See “System-board switches and jumpers” on page 51 for the location of J42.)
7. If you are installing a full-length adapter, lift the adapter-retention clip on the adapter-support bracket. Otherwise, continue with the next step.
8. See the documentation that comes with your adapter for any cabling instructions. It might be easier for you to route cables before you install the adapter.

   Attention: Avoid touching the components and gold-edge connectors on the adapter.
9. Remove the adapter from the static-protective package.
10. Install the adapter:

a. If you are installing a full-length adapter, remove the blue adapter guide (if any) from the end of the adapter.



b. Carefully grasp the adapter by its top edge or upper corners, and align it with the expansion slot on the system board.

Attention: When you install an adapter in the server, be sure that it is completely and correctly seated in the system-board connector. Incomplete insertion might cause damage to the system board or the adapter.

c. Press the adapter *firmly* into the expansion slot.

Note: If the server is subject to excessive movement or vibration, you can secure the adapter with a screw: insert one of the backup expansion-slot screws (stored next to slot 1) through the top of the adapter bracket into the screw hole to secure the adapter before proceeding to the next step.

d. Lower the adapter-retention latch over the top corner of the adapter. In slot 5 or 6, make sure the latch is in the locked (closed) position.

11. If you installed a full-length adapter, close the adapter-retention clip on the adapter-support bracket. Otherwise, continue with the next step.
12. Connect any needed cables to the adapter.

    Attention: When you route the cables, do not block the ventilated space around any of the fans.
13. If you have other options to install or remove, do so now; otherwise, go to “Installing the server bezel and left-side cover (tower model)” on page 100 or “Installing the server bezel and top cover (rack configuration)” on page 103.

Cabling example for a ServeRAID controller

You can install an optional IBM ServeRAID controller in your server to control the internal hot-swap hard disk drives. A ServeRAID controller can, for example, enable you to configure the internal hot-swap hard disk drives into disk arrays. The illustrations in this section show the cabling for internal hot-swap hard disk drives. You can also cable a ServeRAID adapter to external hard disk drives. See your

ServeRAID controller option documentation for complete instructions for installing a ServeRAID controller in your server and for additional information about ServeRAID controllers.

Notes:

1. This cabling example does not apply to the ServeRAID-5i controller, which uses the integrated SCSI controller with RAID capabilities on the system board.
2. An optional ServeRAID-5i controller can be installed only in PCI-X slot 4. Slot 4 is the only PCI-X slot that supports the ServeRAID-5i controller requirements.
3. Connections made to external SCSI devices will be asynchronous.

If you are connecting the adapter to any internal SCSI backplane or device, you will need to purchase additional SCSI cables. Contact your IBM marketing representative or reseller for additional information about the number and types of cables that your server configuration requires.

Your server comes with one SCSI cable that can only be used with the integrated SCSI controller with RAID capabilities that is on the system board. One end of this SCSI cable is attached to the connector on the SCSI backplane, and the other end is attached to the SCSI channel A connector on the system board. The SCSI channel B connector on the system board is available for use, but the server does not come with a cable attached to it.

The following procedure describes the cable routing that is necessary when you install a ServeRAID controller other than ServeRAID-5i.

Notes:

1. See the documentation that comes with your adapter for any cabling instructions.
2. Cable identifiers are printed on the cables that come with your server and options. Use these identifiers to connect the cables to the correct connectors. For example, the hard disk drive cables are labeled “HDD option.”

Complete the following steps to cable the ServeRAID controller:

1. Determine the number of SCSI channels that you want to use on the ServeRAID controller.
2. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
3. Turn off the server and disconnect all power cords and external cables (“Turning off the server” on page 9); then, remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 55 or “Removing the server top cover and bezel (rack configuration)” on page 57).
4. Lift the adapter-retention clip on top of the adapter-support bracket; then, remove the full-length adapters.
5. Lift and remove the plastic dividers from PCI-X slots 5 and 6 by lifting the ends of the dividers out of the adapter support bracket and tilting the dividers up out of the server.
6. Disconnect internal cables as necessary, remove the air-baffle assembly, and remove the adapter-support bracket from the server. For complete details, see “Removing and installing the adapter-support bracket” on page 58.

   Note: You must remove the air-baffle assembly whenever you remove the adapter-support bracket.

7. Disconnect the internal SCSI cable from SCSI connector A (J44) or B (J51) on the system board. See “System-board internal cable connectors” on page 49 for the location of the SCSI connectors.

   Note: The SCSI cables that come with your server can only be used with the integrated SCSI controller with RAID capabilities. If a RAID controller other than the ServeRAID-5i isinstalled, you must use SCSI cables that are compatible with that controller. To select and order the correct cables for use with your RAID controller, contact your IBM reseller or IBM marketing representative.

8. Reinstall the adapter-support bracket in the server (see “Removing and installing the adapter-support bracket” on page 58).

   Important: To ensure proper cooling and server operation, you must keep the air-baffle cover closed.

   Note: You must reinstall the air-baffle assembly when you reinstall the adapter-support bracket. Make sure that no cable is under the adapter-support bracket or interferes with the center fans.

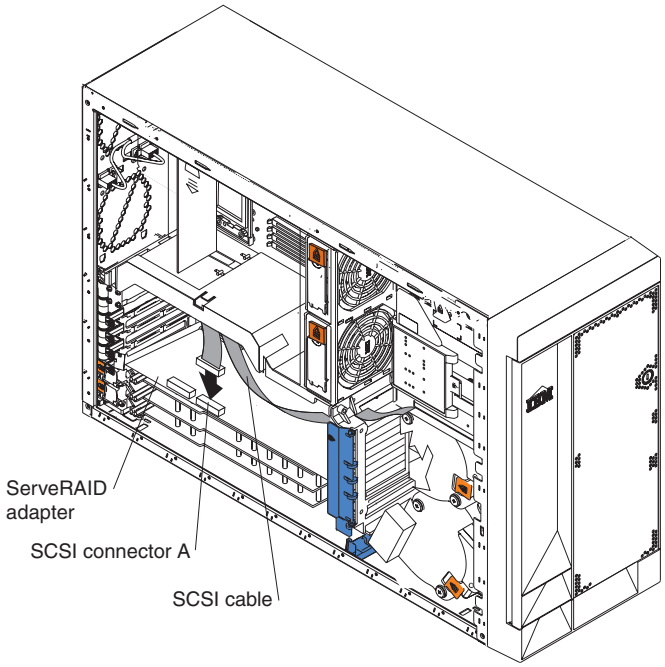
9. Reinstall the plastic dividers between the Active PCI-X adapter slots.
10. Reinstall the adapters that you removed. If you have not yet installed the ServeRAID controller, install it now.

    See “Installing a hot-plug adapter (slots 5 and 6)” on page 62 or “Installing a non-hot-plug adapter (any slot)” on page 64 for instructions for installing a hot-plug or non-hot-plug adapter; then, return to this step.

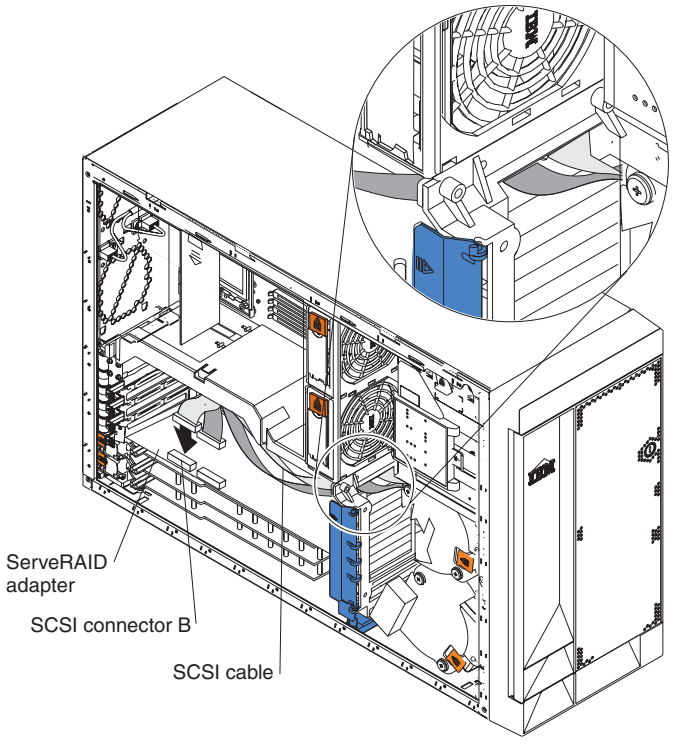
11. Replace the SCSI cable on the SCSI backplane with the SCSI cable for your new ServeRAID controller. The SCSI cable being replaced was one of the cables that was disconnected from the system board in step 7.
12. Route the free end of the SCSI cable from the SCSI backplane through the adapter-support bracket opening and toward the ServeRAID controller (see the illustration in step 13).
13. Attach the free end of the SCSI cable to the selected internal SCSI channel connector on the ServeRAID controller. Make sure that the other end of the SCSI cable is attached to the connector on the SCSI backplane.

    Attention: When you route the SCSI cable, do not block the ventilated space around any of the fans.

    The following illustration shows how to route one SCSI cable to the ServeRAID controller.



14. If you are connecting the adapter to a second SCSI backplane on the server, repeat steps 11 through 13 for the second backplane, and then continue with step 15. Otherwise, continue with step 15.
    The following illustration shows how to route two SCSI cables from backplanes to the ServeRAID controller (in PCI slot 3 in this illustration).



Note: If you plan to attach external SCSI devices, you must order additional SCSI cables. To select and order the correct cables for use with external devices, contact your IBM reseller or IBM marketing representative.

15. If you have other options to install or remove, do so now; otherwise, go to "Installing the server bezel and left-side cover (tower model)" on page 100 or "Installing the server bezel and top cover (rack configuration)" on page 103.

Working with the 3-Pack Ultra320 Hot-Swap Expansion option

Your server contains hardware that enables you to replace a failed hard disk drive without turning off the server. Therefore, you have the advantage of continuing to operate your system while a hard disk drive is removed or installed. These drives are known as *hot-swap* drives. The hot-swap drives are attached to a hot-swap hard disk drive *backplane*. The backplane is a printed circuit board behind the drive bays. For more information about drive bays and drive installation, see "Installing internal drives" on page 74. The low voltage differential (LVD) SCSI hot-swap hard disk drive backplane supports a maximum of six slim-high, hot-swap hard disk drives.

If you install the 3-Pack Ultra320 Hot-Swap Expansion option, you can attach up to three additional drives. All of these drives must be LVD hard disk drives that operate at 320 MB per second or lower. The optional 3-Pack Ultra320 Hot-Swap Expansion Kit contains a hot-swap hard disk drive backplane that you install adjacent to the standard hot-swap hard disk drive backplane. It also includes the SCSI cable you need to install the option. Your server supports a maximum of two hot-swap drive backplanes.

Note: All drives being used in the server should have the same throughput speed rating: mixing speed ratings might cause all drives to operate at the lower throughput speed.

Do the following to configure the channels on the two SCSI backplanes:

- You can configure each SCSI channel (bus) independently. This is the typical backplane configuration. In this configuration:
  - The hard disk drives that are connected to the standard backplane are attached to channel A.
  - The hard disk drives that are connected to the 3-Pack Ultra320 Hot-Swap Expansion option backplane are attached to channel B.

Notes:

1. The standard LVD SCSI backplane is also known as the SCSI backplane or the hot-swap hard disk drive backplane.
2. The SCSI backplane that comes with the 3-Pack Ultra320 Hot-Swap Expansion Kit is also known as the 3-Pack backplane.
3. Table 8 on page 112 lists the SCSI identifiers (IDs) for the standard LVD SCSI backplane and hard disk drives. Table 9 on page 112 lists the SCSI IDs for the 3-Pack backplane and hard disk drives.
4. Cable identifiers are printed on the cables that come with your server and options. Use these identifiers to connect the cables to the correct connectors. For example, the hard disk drive cables are labeled "HDD option."
5. For information about other options and using the 3-Pack Ultra320 Hot-Swap Expansion option, see the documentation that comes with the option kit.
6. For additional information about cabling, see "Cabling example for a ServeRAID controller" on page 66 and "Cabling the server" on page 106.
7. The SCSI cables that come with your server can only be used with the integrated SCSI controller with RAID capabilities. If a RAID controller other than the ServeRAID-5i is installed, you must use SCSI cables that are compatible

with that controller. To select and order the correct cables for use with your RAID controller, contact your IBM reseller or IBM marketing representative.

Installing the 3-Pack Ultra320 Hot-Swap Expansion option

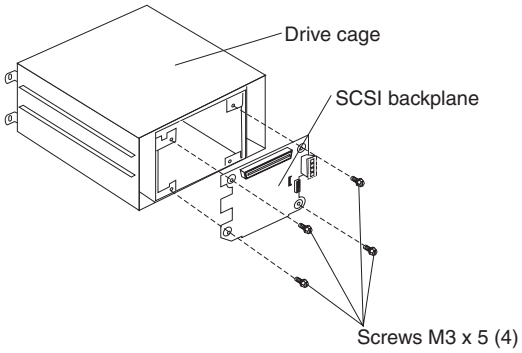
Notes:

1. The 3-Pack Ultra320 Hot-Swap Expansion Kit might contain some components that you will not need for this procedure. For information about the contents of this option kit, see the documentation that comes with the option kit.
2. The 3-Pack Ultra320 Hot-Swap Expansion option does not support use of a SCSI repeater card.

Complete the following steps to install the 3-Pack Ultra320 Hot-Swap Expansion option:

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Turn off the server and disconnect all power cords and external cables (“Turning off the server” on page 9); then, remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 55 or “Removing the server top cover and bezel (rack configuration)” on page 57).
3. If necessary, remove the air-baffle assembly, adapter-support bracket, adapters, and plastic dividers. See “Removing and installing the adapter-support bracket” on page 58 and “Working with adapters” on page 60 for additional information.

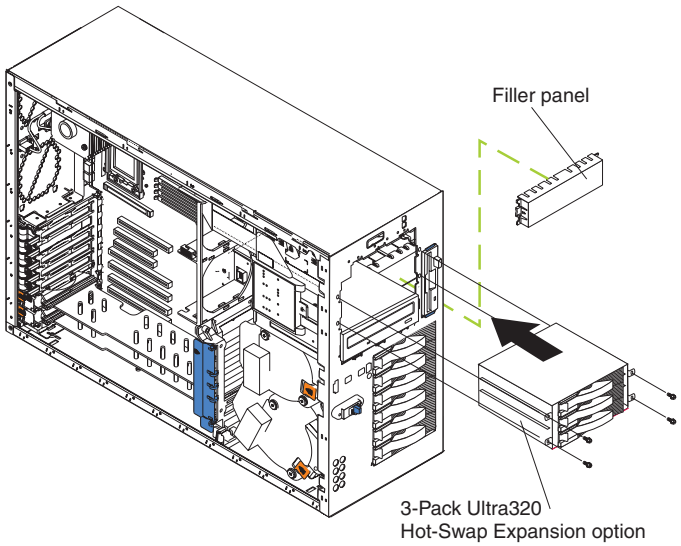
   Attention: The server electromagnetic interference (EMI) integrity and cooling are both protected by having the front bays covered or occupied. When you install the 3-Pack Ultra320 Hot-Swap Expansion option, save the filler panels from the bay, in case you later remove the 3-Pack Ultra320 Hot-Swap Expansion option and do not replace it with another device.
4. Remove the two filler panels from the removable-media bay opening. Store the filler panels for future use.
5. Remove the custom metal slide rails and screws that are inside the 5.25-inch removable-media drive bays. Store the slide rails and screws for future use.
6. Complete the following steps to attach the SCSI backplane to the drive cage:



   a. Place the SCSI backplane on the rear of the cage with the hole and slot in the SCSI backplane aligned with the pins on the drive cage, making sure that the SCSI connector is at the top.
   b. Attach the SCSI backplane to the drive cage using four short M3 x 5 screws.

Note: The 3-Pack Hot-swap Hard Disk Drive Expansion Kit comes with four long M3.5 x 7 screws and four short M3 x 5 screws. Make sure you secure the SCSI backplane to the drive cage with the short screws.

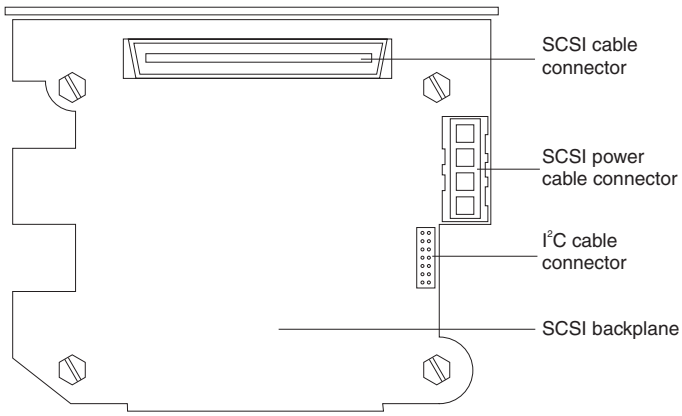
7. Align the 3-Pack Ultra320 Hot-Swap Expansion option with the empty removable-media bay opening, adjacent to the standard hot-swap hard disk drive backplane.
8. Partially slide the 3-Pack Ultra320 Hot-Swap Expansion option into the guides through the front of the removable-media bay opening, as shown in the following illustration. Leave adequate room at the rear of the 3-Pack Ultra320 Hot-Swap Expansion option to connect the required cables.



9. Locate the short SCSI cable that comes with this kit:

   Note: The SCSI cables that come with this kit can only be used with the integrated SCSI controller with RAID capabilities. If a RAID controller other than the ServeRAID-5i isinstalled, you must use SCSI cables that are compatible with that controller. To select and order the correct cables for use with your RAID controller, contact your IBM marketing representative or authorized reseller.

   a. Connect the end of the cable that is labeled “HDD backplane” to the new 3-Pack SCSI backplane as shown in the following illustration. (This illustration shows the rear connectors on the 3-Pack SCSI backplane, as viewed from the rear of the server.)



b. Connect the other end of the cable to the SCSI connector on the system board if you are using the integrated SCSI controller with RAID capabilities. If you are using an optional RAID controller other than the ServeRAID-5i, connect the other end of the cable to the SCSI connector on this RAID controller.

c. Secure both cable ends with the retention clips on the SCSI connectors.

10. Locate the I^2C cable that comes with this kit.

    Note: Both I^2C cable connectors are the same, enabling this cable to be connected in either direction.

    a. Connect one of the I^2C cable connectors to the SCSI backplane.

    b. Connect the other I^2C cable connectors to the new 3-Pack SCSI backplane. See the illustration in step 9 on page 72 for the cable connector location.

11. Connect the end of the power-supply power cable that is labeled “HDD2” to the new 3-Pack backplane. See the illustration in step 9 for the cable connector location.

12. Slide the 3-Pack Ultra320 Hot-Swap Expansion option into the server until it stops. Secure the 3-Pack Ultra320 Hot-Swap Expansion option to the server with the four screws that come with it.

13. If you removed the air-baffle assembly, adapters, plastic dividers, and adapter-support bracket in step 3 on page 71, reinstall them (see “Removing and installing the adapter-support bracket” on page 58).

    Note: Make sure that no cable is under the adapter-support bracket or interferes with the center fans.

14. Install additional internal hot-swap hard disk drives in the 3-Pack Ultra320 Hot-Swap Expansion option (see “Installing a hot-swap hard disk drive” on page 77).

    Note: The 3-Pack backplane sets the SCSI IDs for these hot-swap hard disk drives. See “SCSI IDs” on page 111 for additional information.

15. If you have other options to install or remove, do so now; otherwise, go to “Installing the server bezel and left-side cover (tower model)” on page 100 or “Installing the server bezel and top cover (rack configuration)” on page 103.

Installing internal drives

If you add different types of drives, your system can read multiple types of media and store more data. Several types of drives are available, such as:

- Diskette
- Hard disk
- CD-ROM
- DVD-ROM
- Tape, including digital linear tape (DLT), super digital linear tape (SDLT), and linear tape-open (LTO)

Note: The server supports both internal and external tape drives.

Your server contains hardware that enables you to replace a failed hard disk drive without turning off the server. Therefore, you have the advantage of continuing to operate your system while a hard disk drive is removed or installed. These drives are known as *hot-swap* drives.

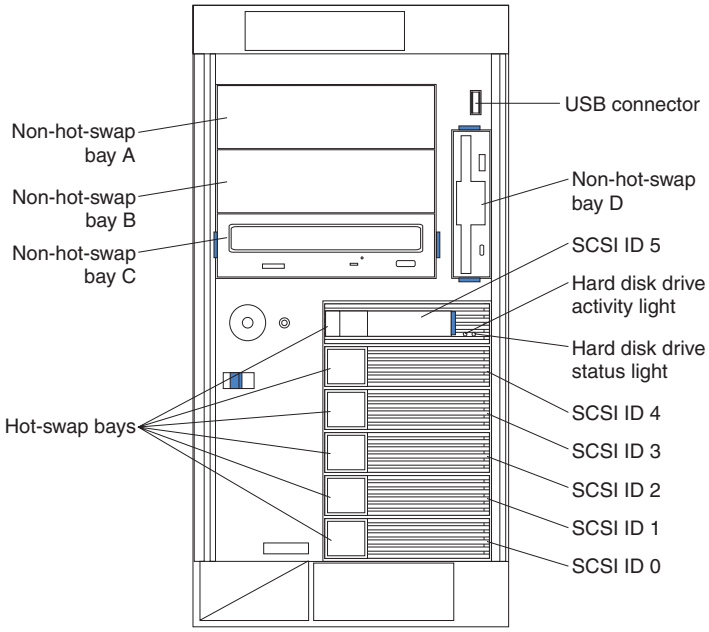
Each hot-swap drive has two indicator LEDs (see “Server controls and indicators” on page 4). If the amber hard disk status LED for a drive is lit continuously, that individual drive is faulty and requires replacement. When the hard disk drive status LED indicates a drive fault, you can replace a hot-swap drive without turning off the server.

Each hot-swap drive that you plan to install must be mounted in a hot-swap-drive tray. The drive must have a Single Connector Attachment (SCA) connector. Hot-swap-drive trays come with hot-swap drives.

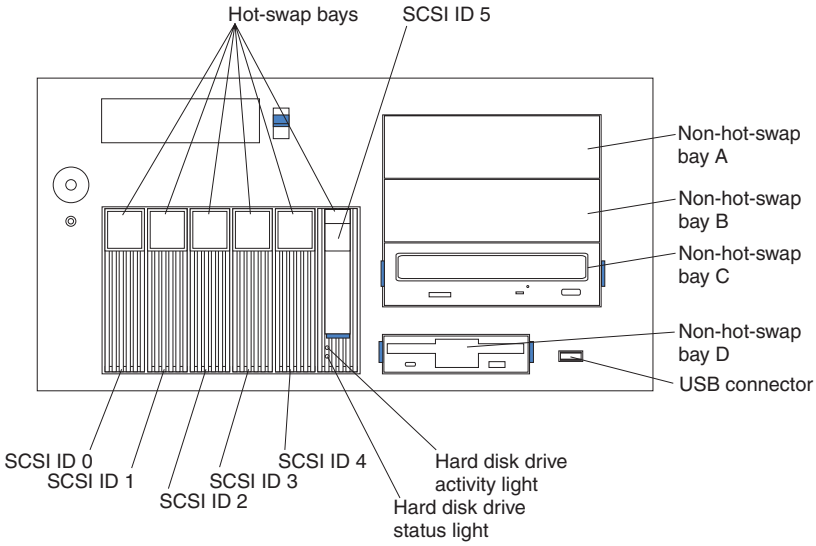
Internal drive bays

Internal drives are installed in *bays*.

Tower model



Rack configuration



Note: The SCSI IDs for the hot-swap drives are printed on the bezel, immediately adjacent to the hot-swap drive bays (see Table 8 on page 112).

- Your server comes with one 3.5-inch, 1.44 MB diskette drive.
- Your server also comes with one integrated drive electronics (IDE) CD-ROM drive. The CD-ROM drive bay supports a 5.25-inch, half-high, removable-media drive.
- You can install two additional 5.25-inch, half-high, removable-media drives or one additional 5.25-inch, full-high, removable-media drive in the removable-media

drive bays (A and B). The server supports full-high and half-high DLT, SDLT, and LTO drives. For a list of supported options for your server, go to http://www.ibm.com/pc/us/compat/ on the World Wide Web.

A three-drop power signal cable and a one-drop IDE cable come attached to the CD-ROM drive. Use this power signal cable to connect the removable-media drives. The one-drop SCSI signal cable that comes with your server will need to be replaced with a two-drop SCSI signal cable to provide a signal connection to the removable-media drives.

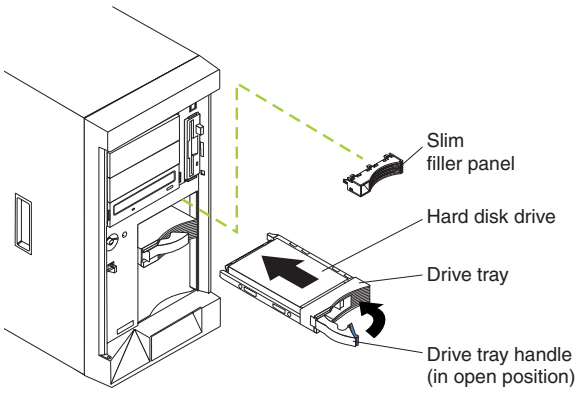
- You cannot install hot-swap drives in the removable-media or non-hot-swap drive bays on the front side of the server, unless you install the 3-Pack Ultra320 Hot-Swap Expansion option.
- Your server supports a maximum of six 1-inch (26 mm) slim-high, 3.5-inch, hot-swap hard disk drives in the standard hot-swap bays. In the tower model, the hot-swap bays are arranged vertically in the standard hard disk drive cage; the bay numbers are 0 through 5 (from bottom to top). In the rack configuration, the hot-swap bays are arranged horizontally in the standard hard disk drive cage; the bay numbers are 0 through 5 (from left to right). In the tower model, bays 0 through 5 are below the removable-media drive bays. In the rack configuration, bays 0 through 5 are to the left of the removable-media drive bays.

Notes:

1. To minimize the possibility of damage to the hard disk drives when you are installing them in a rack configuration, install the server in the rack before installing the hard disk drives.
2. You do not have to turn off the server to install hot-swap drives in the hot-swap drive bays. However, you must turn off the server when performing any steps that involve installing or removing cables.
3. You can install three additional hot-swap hard disk drives in the server after you install the 3-Pack Ultra320 Hot-Swap Expansion option (see “Working with the 3-Pack Ultra320 Hot-Swap Expansion option” on page 70). These drives are in the optional hard disk drive cage. The SCSI IDs are listed in Table 8 on page 112.
4. Some filler panels might come with a slim filler.

Installing a hot-swap hard disk drive

The following illustration shows how to install a hot-swap hard disk drive.



Complete the following steps to install a drive in a hot-swap bay.

Attention: To maintain proper system cooling, do not operate the server for more than 10 minutes without either a drive or a filler panel installed for each bay.

Note: All hot-swap drives being used in the server should have the same throughput speed rating; mixing speed ratings might cause all drives to operate at the lower throughput speed.

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Remove the filler panel from one of the empty hot-swap bays.
3. Install the hard disk drive in the hot-swap bay:
   a. Ensure that the tray handle is open (that is, perpendicular to the drive).
   b. Align the drive assembly with the guide rails in the bay.
   c. Gently push the drive assembly into the bay until the drive stops.
   d. Push the tray handle to the closed (locked) position.
   e. Check the hard disk drive status indicator to verify that the hard disk drive is operating properly.

      If the amber hard disk drive status LED for a drive is lit continuously, that drive is faulty and needs to be replaced. If the green hard disk drive activity LED is flashing, the drive is being accessed.

      Note: If your server is configured for RAID operation using the integrated SCSI controller with RAID capabilities or an optional ServeRAID controller, you might need to reconfigure your disk arrays after installing hard disk drives. See the ServeRAID documentation on the *IBM ServeRAID Support* CD for additional information on RAID operation and complete instructions for using ServeRAID Manager.

Installing a 5.25-inch removable-media drive

Your server also comes with one integrated drive electronics (IDE) CD-ROM drive. The CD-ROM drive bay supports a 5.25-inch, half-high, removable-media drive.

You can install two additional 5.25-inch, half-high, removable-media drives or one additional 5.25-inch, full-high, removable-media drive in the removable-media drive bays (A and B).

A three-drop power cable comes with your server. Use this cable to connect power to the removable-media drives. The one-drop SCSI signal cable that comes with your server will need to be replaced with a two-drop SCSI signal cable to provide a signal connection to the removable-media drives.

Note: The SCSI cables that come with your server can only be used with the integrated SCSI controller with RAID capabilities. If a RAID controller other than the ServeRAID-5i isinstalled, you must use SCSI cables that are compatible with that controller. To select and order the correct cables for use with your RAID controller, contact your IBM reseller or IBM marketing representative.

Check the instructions that come with the drive to see if you need to set any switches or jumpers on the drive.

Complete the following steps to install a removable-media drive in bay A or B (see “Internal drive bays” on page 75):

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Turn off the server and disconnect all power cords and external cables (“Turning off the server” on page 9); then, remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 55 or “Removing the server top cover and bezel (rack configuration)” on page 57).
3. Choose the bay in which you want to install the drive.
4. Remove the filler panel from the removable-media bay opening. Store the filler panel for future use.

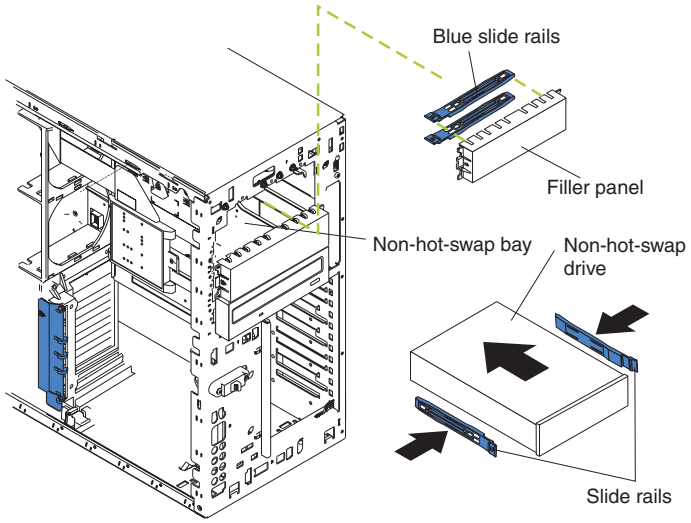
   Note: The server electromagnetic interference (EMI) integrity and cooling are both protected by having the front bays covered or occupied. When you install a drive, save the filler panel from the bay, in case you later remove the drive and do not replace it with another.
5. Touch the static-protective package that contains the drive to any unpainted metal surface on the server; then, remove the drive from the package and place it on a static-protective surface.
6. Set any jumpers or switches on the drive according to the documentation that comes with the drive.
7. Install the drive:

   See the following illustration when installing a 5.25-inch removable-media drive.

   Note: Use the blue plastic slide rails that come with the server as described in this step, unless the drive comes with custom metal slide rails.

If you are installing an SDLT drive, use the custom metal slide rails and screws that come with the option package. Follow the installation instructions that come with the option package; then, continue with step 7c.

If you are installing a full-high DLT drive, use the custom metal slide rails and screws that are inside the 5.25-inch removable-media drive bays. Follow the installation instructions that come with the option package; then, continue with step 7d.



a. Remove the blue snap-on slide rails from inside the filler panel.
b. Clip the slide rails onto the sides of the drive.
c. Store the filler panel for later use.
d. Align the slide rails on the drive with the guide rails in the bay; then, slide the drive into the bay until it snaps into place.

8. Replace the one-drop SCSI signal cable in your server with a two-drop SCSI signal cable, connecting the additional connector on the two-drop SCSI signal cable to the rear of the removable-media drive.
9. Connect a power cable to the back of the drive. A three-drop power cable for removable-media drives comes installed in your server. It is attached to the standard CD-ROM drive. The connectors are keyed and can be inserted only one way.
10. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 99.

Installing memory modules

Adding memory to your server is an easy way to make programs run faster. You can increase the amount of memory in your server by installing memory-module options. When you install memory, you must install a pair of matched dual inline memory modules (DIMMs).

Notes:

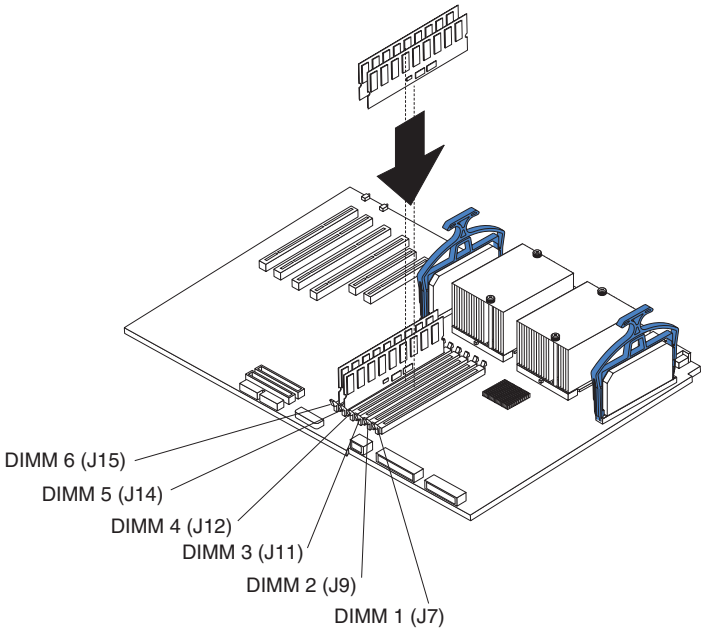
1. The system board contains 6 DIMM connectors and supports two-way memory interleaving.
2. The DIMM options available for your server are 128 MB, 256 MB, 512 MB, and 1 GB. Your server supports a minimum of 256 MB and a maximum of 6 GB of system memory.
3. The amount of usable memory will be reduced depending on the system configuration. A certain amount of memory must be reserved for system resources. The BIOS will display the total amount of installed memory and the amount of configured memory.
4. When you install additional DIMMs, be sure to install them in pairs. Both of the DIMMs in a single pair must be the same size, speed, type and technology. You can mix compatible DIMMs from various manufacturers.
5. Each DIMM pair does not have to contain DIMMs of the same size, speed, type, and technology as the first pair.
6. Install only 133 MHz/266 MHz, 2.5 V, 184-pin, double-data-rate (DDR), PC2100, registered synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC) DIMMs. These DIMMs must be compatible with the latest PC2100 SDRAM Registered DIMM specification. For a list of supported options for your server, go to http://www.ibm.com/us/compat/ on the World Wide Web.
7. Your server supports Chipkill™ memory if the DIMMs are all type x4 and are larger than 128 MB. Using any 128 MB DIMMs, or DIMMs that are not type x4, on your server disables Chipkill memory.
8. You do not need to save new configuration information when installing or removing DIMMs. The only exception is if you replace a faulty DIMM that was marked as **Disabled** in the **Memory Settings** menu. In this case, you need to re-enable that memory row in the Configuration/Setup Utility or reload the default memory settings (see “Choices available from the Configuration/Setup main menu” on page 16).

Install the DIMMs in the order shown in the following table.

Table 7. DIMM installation sequence

Pair	DIMM connectors	Diagnostic reference
First	6 and 5 (J15, J14)	Bank 3
Second	4 and 3 (J12, J11)	Bank 2
Third	2 and 1 (J9, J7)	Bank 1

The following illustration shows the DIMM connector locations and how to install DIMMs on the system board.

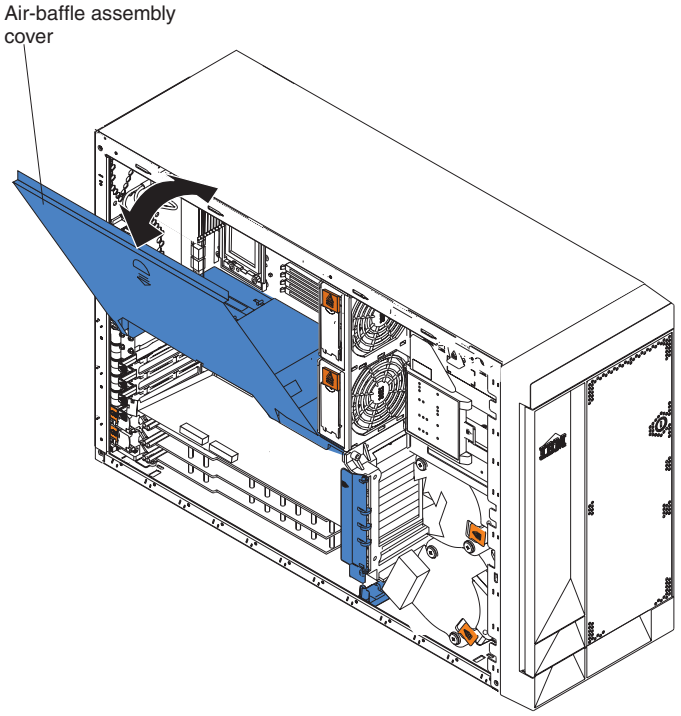


Before you begin, read the documentation that comes with your option.

Complete the following steps to install a DIMM:

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.

2. Turn off the server and disconnect all power cords and external cables (“Turning off the server” on page 9); then, remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 55 or “Removing the server top cover and bezel (rack configuration)” on page 57).
3. Open the cover on the air-baffle assembly.



Note: It is not necessary to remove the air-baffle assembly to perform this step.

4. Locate the DIMM connectors on the system board. Determine the connectors into which you will install the DIMMs. (See Table 7 on page 80 for the correct DIMM installation sequence.)
5. Touch the static-protective package that contains the DIMM option to any unpainted metal surface on the server. Then, remove the DIMM from the package.
6. To install the DIMMs, repeat the following steps for each DIMM that you install:
   a. Turn the DIMM so that the DIMM keys align correctly with the connector on the system board.

      Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, handle the clips gently.

   b. Insert the DIMM by pressing the DIMM straight into the connector. Be sure that the retaining clips snap into the closed positions.

      Note: If a gap exists between the DIMM and the retaining clips, the DIMM has not been properly installed. In this case, open the retaining clips and remove the DIMM; then, reinsert the DIMM.
7. Close the cover on the air-baffle assembly.
8. If you have other options to install or remove, do so now; otherwise, go to “Installing the server bezel and left-side cover (tower model)” on page 100 or “Installing the server bezel and top cover (rack configuration)” on page 103.

Installing an additional microprocessor

Your server comes with one or two microprocessors installed on the system board. Your server supports up to two microprocessors. With two microprocessors, your server can operate as a symmetric multiprocessing (SMP) server. With SMP, certain operating systems and application programs can distribute the processing load among the microprocessors. If your server comes with one microprocessor, you can install a second microprocessor.

Before you begin:

- Thoroughly review the documentation that comes with the microprocessor to determine the required BIOS update. The latest level of BIOS code for your server is available through the World Wide Web (see "Recovering the BIOS code" on page 40).
- (Optional) Obtain an SMP-capable operating system. For a list of supported operating systems and other options, go to http://www.ibm.com/pc/us/compat/ on the World Wide Web.

Attention:

- To ensure proper server operation when you install an additional microprocessor, use microprocessors that have the same cache size and type, and the same clock speed. Microprocessor internal and external clock frequencies must be identical. You can use the Configuration/Setup Utility program in your server to determine the specific type of microprocessor on your system board.
- Some models of the xSeries 235 are designed for 400 MHz microprocessors while others are designed for 533 MHz microprocessors. An attempt to plug a 400 MHz microprocessor into a system board designed for a 533 MHz processor may damage the components.
- If the CR14 LED on the system board is illuminated (see "System-board LED locations" on page 53), it indicates a microprocessor mismatch.

For a list of microprocessors supported by your server, see the ServerProven® list at http://www.ibm.com/pc/us/compat/ on the World Wide Web.

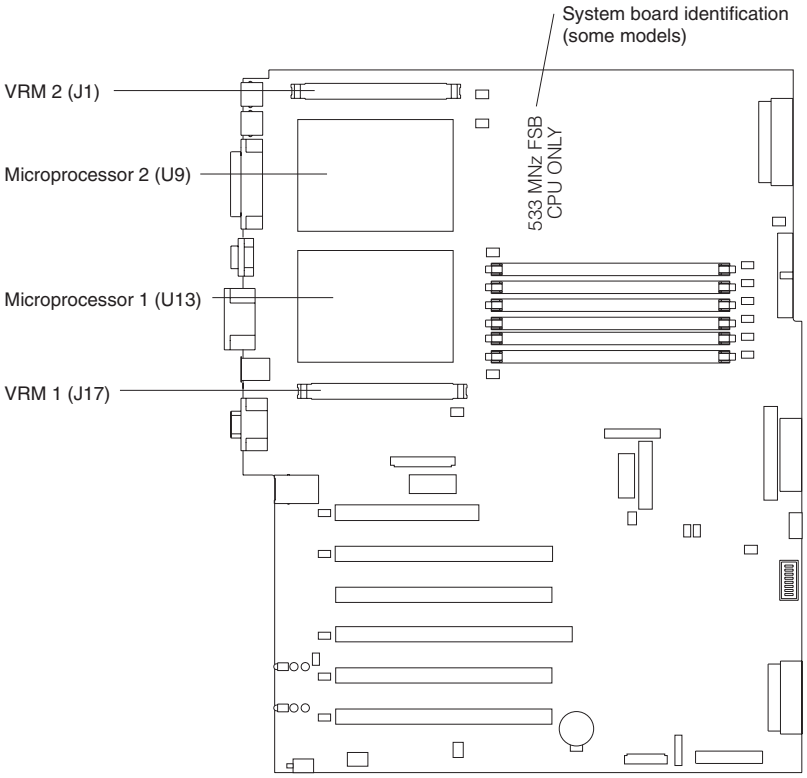
Important: A boot processor must always be installed in socket U13 of the system board.

Notes:

1. To order additional microprocessor options, contact your IBM reseller or IBM marketing representative.
2. When you install a microprocessor in socket U9, you must also install the voltage regulator module (VRM) that comes with the microprocessor, in VRM connector J1.
3. The microprocessor sockets in this server contain built-in termination for the microprocessor bus; therefore, terminator cards are not required for empty microprocessor sockets. However, for airflow, an empty microprocessor socket must contain a microprocessor baffle.
4. The microprocessor speeds are automatically set for this server; therefore, you do not need to set any microprocessor frequency-selection jumpers or switches.
5. If you need to remove a microprocessor, see "Microprocessor removal" on page 117.

The following illustration is a simplified layout of the microprocessor connector locations and other microprocessor-related components on the system board.

Attention: The speed of the microprocessor must match the speed of the system board. The 533 MHz system board is identified as shown in the following illustration; the 400 MHz system board is not marked.



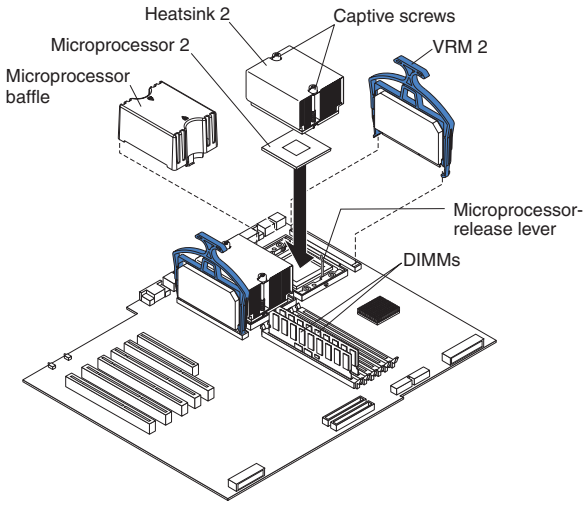
Note: For additional illustrations of the system-board components, see "System-board option connectors" on page 48.

Complete the following steps to install an additional microprocessor:

1. Review the information in "Installation guidelines" on page 45, "Handling static-sensitive devices" on page 46, and "Safety information" on page 169.

2. Turn off the server and disconnect all power cords and external cables (“Turning off the server” on page 9); then, remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 55 or “Removing the server top cover and bezel (rack configuration)” on page 57).
3. Open the cover on the air-baffle assembly. (See the illustration following step 3 on page 82, if needed.)

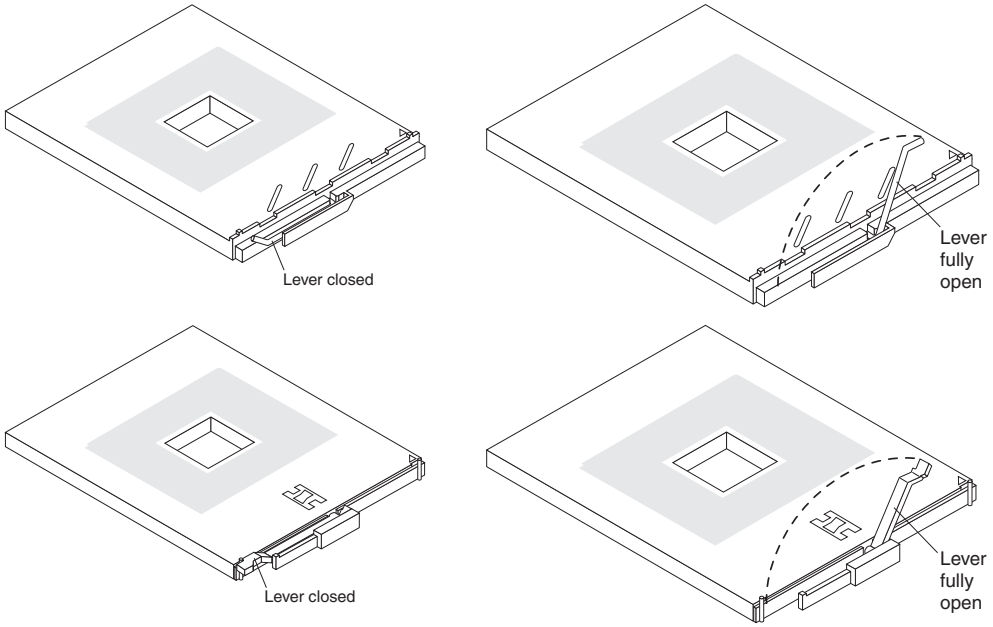
   Note: It is not necessary to remove the air-baffle assembly to perform this step.
4. Locate the second microprocessor socket (connector U27) on the system board.
5. Remove the microprocessor baffle from the microprocessor socket.
6. Remove the protective cover, tape or label from the surface of the microprocessor socket, if present.



7. Install a VRM in the corresponding VRM connector (J1):
   a. Center the VRM over the connector. Make sure that the VRM is oriented and aligned correctly.
   b. Carefully but firmly push down the VRM clip handle to seat the VRM in the connector.
   c. Make sure that the VRM clip locks on the VRM connector at both sides.

   CAUTION:
   You must lift up the microprocessor-release lever before inserting the microprocessor into the socket. Inserting the microprocessor into the socket without lifting up the microprocessor-release lever can damage the microprocessor and system board.
8. Install the microprocessor:
   a. Touch the static-protective package containing the new microprocessor to any *unpainted* metal surface on the server; then, remove the microprocessor from the package.
   b. Rotate the locking lever on the microprocessor socket from its closed and locked position until it stops or clicks in the fully open position (approximately 135° angle), as shown. Then, see the documentation provided with the microprocessor option for complete installation instructions.

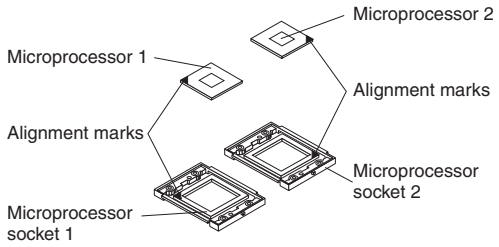
Attention: You must ensure that the locking lever on the microprocessor socket is in the fully open position before you insert the microprocessor in the socket. Failure to do so might result in permanent damage to the microprocessor, microprocessor socket, and system board.



c. Center the microprocessor over the microprocessor socket. Align the triangle on the corner of the microprocessor with the triangle on the corner of the socket and carefully press the microprocessor into the socket.

   Attention:

   - Do not use excessive force when pressing the microprocessor into the socket.
   - Make sure that the microprocessor is oriented and aligned correctly with pin number 1 in the socket before you try to close the microprocessor-release lever. The following illustration shows the alignment marks for both microprocessors and sockets.

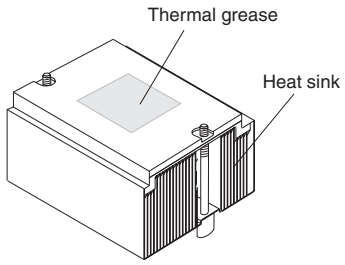


d. Carefully close the microprocessor-release lever to secure the microprocessor in the socket.

9. Install a heat sink on the microprocessor:
   a. Remove the protective film from the bottom of the heat sink.

      Notes:

      1) Do not set the heat sink down after you remove the protective film.



2) Do not touch the thermal grease on the bottom of the heat sink. Touching the thermal grease will contaminate it. If the thermal grease on the microprocessor or heat sink becomes contaminated, contact your service technician.

b. Align and place the heat sink on top of the microprocessor (grease side down) in the retention bracket. Press firmly on the heat sink.

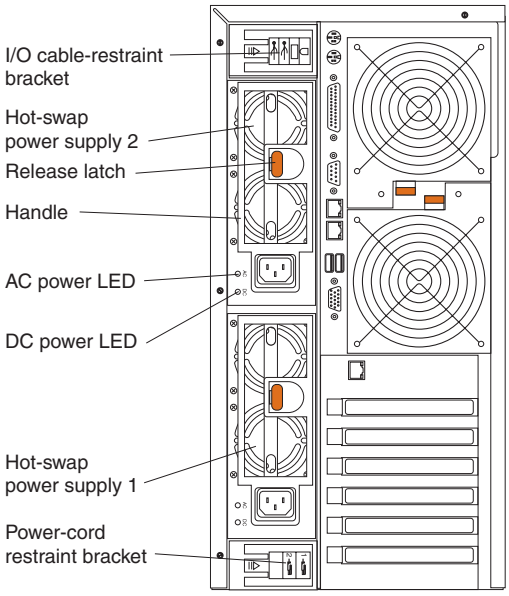
c. Secure the heat sink to the microprocessor by tightening the captive screws. Alternate between the two captive screws in the heat sink while tightening them.

Attention: Alternate the tightening of the two captive screws to prevent damage to the microprocessor. Ensure that the screws are completely tightened (until they stop); otherwise, damage to the microprocessor will occur.

10. Close the cover on the air-baffle assembly.
11. If you have other options to install or remove, do so now; otherwise, go to "Installing the server bezel and left-side cover (tower model)" on page 100 or "Installing the server bezel and top cover (rack configuration)" on page 103.

Replacing a hot-swap power supply

Some models of your server come with two hot-swap power supplies. You do not need to turn off the server to replace a hot-swap power supply, but you must replace only one power supply at a time.



Before you continue with the power-supply replacement procedure, review the following.

Notes:

1. Two cable-restraint brackets are on the rear of the tower model servers. After you connect the cables to the selected devices, you can use these cable-restraint brackets to manage the cable routing. Route the power cords through the power-cord restraint bracket on the bottom. Route the remaining cables (for example, the cables that are connected to the I/O ports) through the I/O cable-restraint bracket on the top.

If you install or remove a power supply, observe the following precautions.

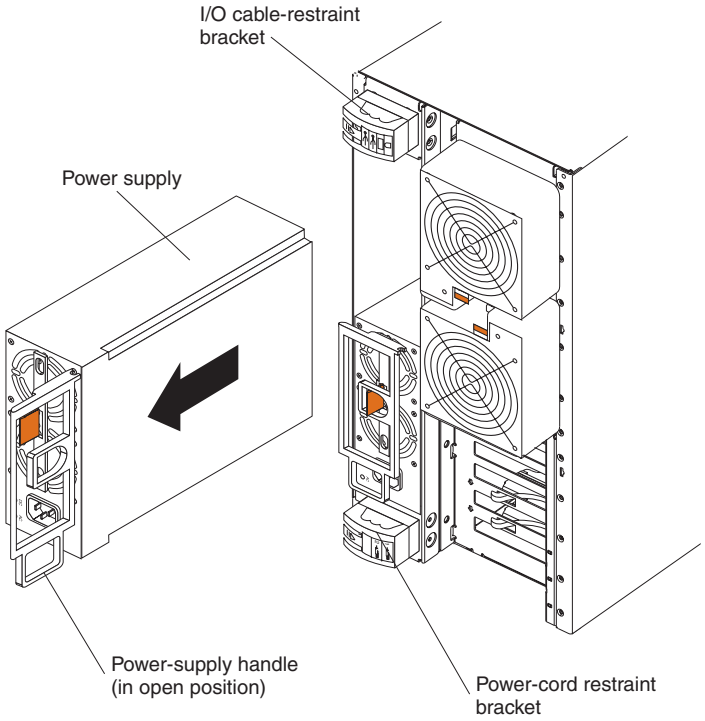
Statement 8

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

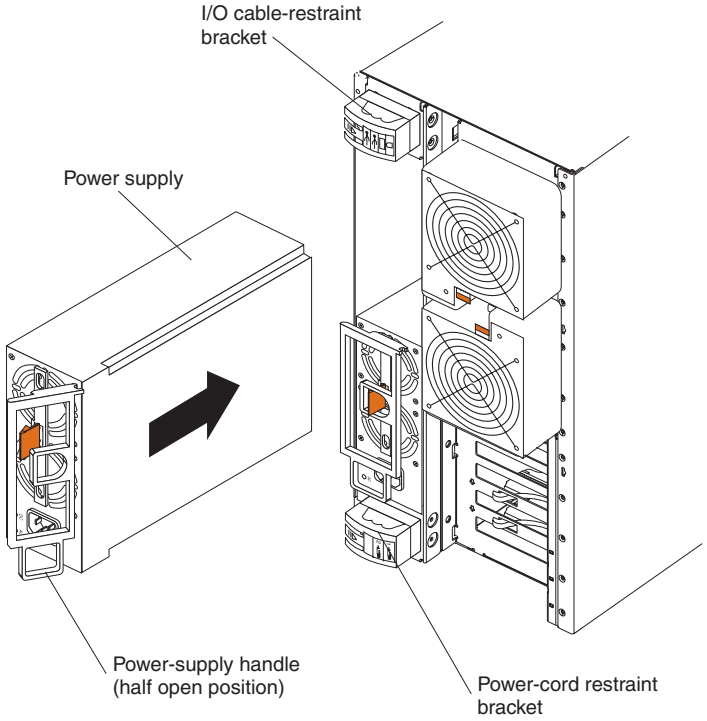
Complete the following steps to replace a hot-swap power supply:

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Unplug the power cord from the selected power supply.
3. Remove the old power supply.



   a. Press the orange release lever and pull the power-supply handle. This moves the power supply out of the power-supply bay slightly.
   b. Pull the power supply out of the bay and set it aside.

4. Install the replacement power supply.



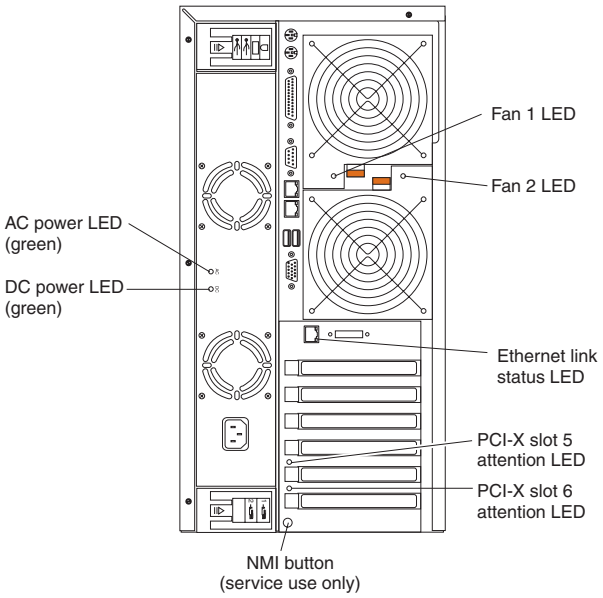
   a. Make sure the handle on the power supply is in the open position, hanging loosely.
   b. Slide the power supply all the way into the chassis; then, press the handle to the closed position until it clicks into place.
5. Plug one end of the power cord into the corresponding connector on the power supply; then, plug the other end of the power cord into a properly grounded electrical outlet.

   Note: You can route the power cord through the power-cord restraint bracket on the rear of the server (tower model only).
6. If the server is not on, turn on the server.
7. Verify that the dc power LED and the ac power LED on the power supply are lit, indicating that the power supply is operating properly.

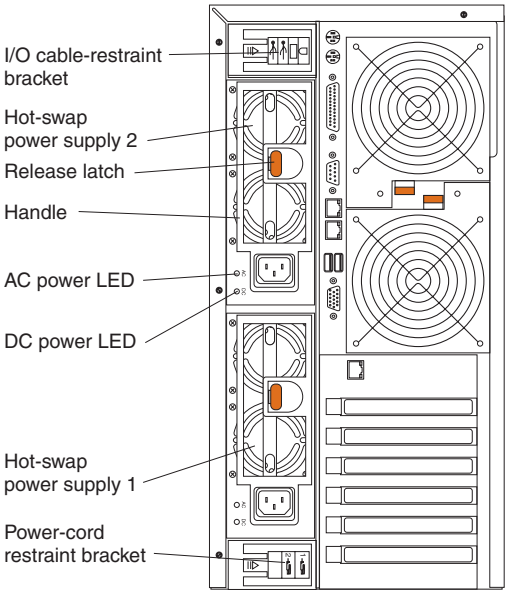
Installing a hot-swap power-supply option

Your server comes with one fixed power supply or two hot-swap power supplies, depending on the server model. If your server has one fixed power supply, you can replace it with the hot-swap power-supply option, giving you two hot-swap power supplies. The two hot-swap power supplies provide power redundancy.

One fixed power supply



Two hot-swap power supplies



Before you continue with the power-supply removal and installation procedure, review the following information.

Notes:

1. During normal operation, both hot-swap power-supply bays must have power supplies installed for redundancy.
2. Two cable-restraint brackets are on the rear of the tower model servers. After you install the hot-swap power-supply option and connect the cables to the selected devices, you can use these cable-restraint brackets to manage the cable routing. Route the power cords through the power-cord restraint bracket on the bottom. Route the remaining cables (for example, the cables that are connected to the I/O ports) through the I/O cable-restraint bracket on the top.

If you install or remove a power supply, observe the following precautions.

Statement 8

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Complete the following steps to remove the fixed power supply and install the hot-swap power-supply option.

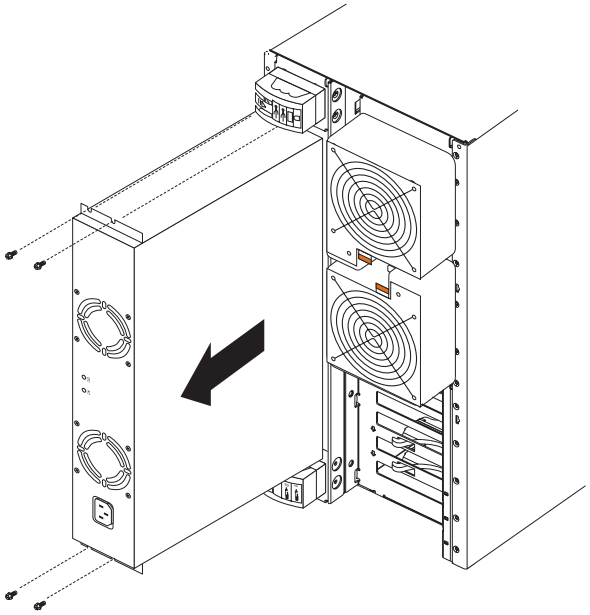
Note: If your server is a tower model, you might find it easier to install the hot-swap power-supply option if you turn the server on its side so that the power supply is on the bottom.

1. Review the information in "Installation guidelines" on page 45, "Handling static-sensitive devices" on page 46, and "Safety information" on page 169.
2. Turn off the server and disconnect all power cords and external cables ("Turning off the server" on page 9); then, remove the server cover (see "Removing the server left-side cover and bezel (tower model)" on page 55 or "Removing the server top cover and bezel (rack configuration)" on page 57).
3. Remove the adapter-support bracket. See "Removing and installing the adapter-support bracket" on page 58 for instructions.
4. Disconnect the power-supply cables from the system board and devices in your server.
   a. Disconnect the small-device power cable (P7) from the back of the diskette drive.

      Note: You might need to remove the diskette drive from the server in order to disconnect and reconnect its cables. The diskette drive is held in the server by release tabs that are accessed by removing the server front bezel.

   b. Disconnect the device power connector (P5) from the back of the CD-ROM drive.
   c. Disconnect the other device power connectors (P4 and P6) from the rear of any other devices in the server.
   d. Disconnect the SCSI cable (P2) from the SCSI backplane.
   e. Disconnect the power cable (P1) from the J4 connector on the system board.
   f. Disconnect the power signal cable (P3) from the J10 connector on the system board.
   g. If your server has the 3-Pack Ultra320 Hot-Swap Expansion option installed, disconnect the power connector (P8) from the power connector on the 3-Pack backplane.

5. Remove the fixed power supply (see the following illustration).



   a. From the rear of the server, remove the two screws at each side of the fixed power supply.
   b. Gently pull the power supply from the server, making sure the cables do not snag on the chassis or system board.

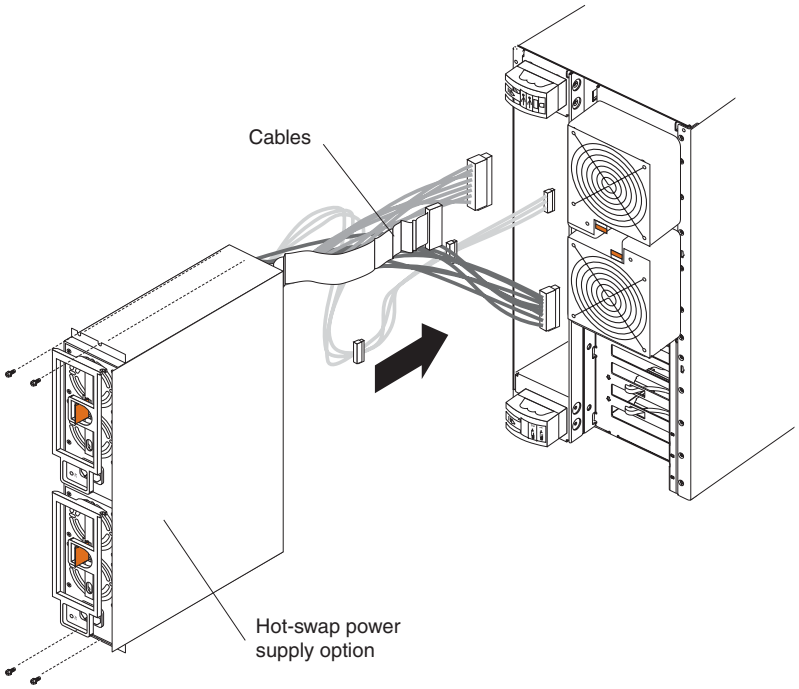
      Note: You might need to insert a fingernail or screwdriver blade behind one corner of the power supply to begin moving it.

   CAUTION:
   When installing the power supply, do not pull it into position by its cables.

6. Install the hot-swap power-supply option.

   Note: The option consists of a hot-swap power-supply cage containing two hot-swap power supplies, with all necessary cables attached to the back

of the option.



a. Push the cables on the back of the power-supply option into the power-supply bay first; then, slide the hot-swap power-supply cage with power supplies into the power-supply bay.
b. From inside the server, pull the cables on the back of the power-supply cage up from under the system board.
c. Secure the hot-swap power-supply cage to the server by installing the two screws at each side of the hot-swap power-supply cage.

7. Connect the power-supply cables to the system board and devices in your server.

   Note: Each connector on these cables is unique. Only one type of cable can be attached to each connector on the system board, backplanes, or devices.

   a. Connect the small-device power cable (P7) to the back of the diskette drive.

      Note: You might need to remove the diskette drive from the server in order to disconnect and reconnect its cables. The diskette drive is held in the server by release tabs that are accessed by removing the server front bezel.

   b. Connect the P5 device power connector to the back of the CD-ROM drive.
   c. Connect the other device power connectors (P4 and P6) to the rear of any other devices in the server.
   d. Connect the SCSI cable (P2) to the SCSI backplane.
   e. Connect the power cable (P1) to the J4 connector on the system board.
   f. Connect the power signal cable (P3) to the J10 connector on the system board.
   g. If your server has the 3-Pack Ultra320 Hot-Swap Expansion option installed, connect the power connector (P8) to the power connector on the 3-Pack backplane.

8. Reinstall the adapter-support bracket. See “Removing and installing the adapter-support bracket” on page 58 for instructions.
9. Replace the server cover (see “Installing the server bezel and left-side cover (tower model)” on page 100 or “Installing the server bezel and top cover (rack configuration)” on page 103.
10. Plug one end of each power cord into the corresponding connector on the power supply; then, plug the other end of each power cord into a properly grounded electrical outlet.

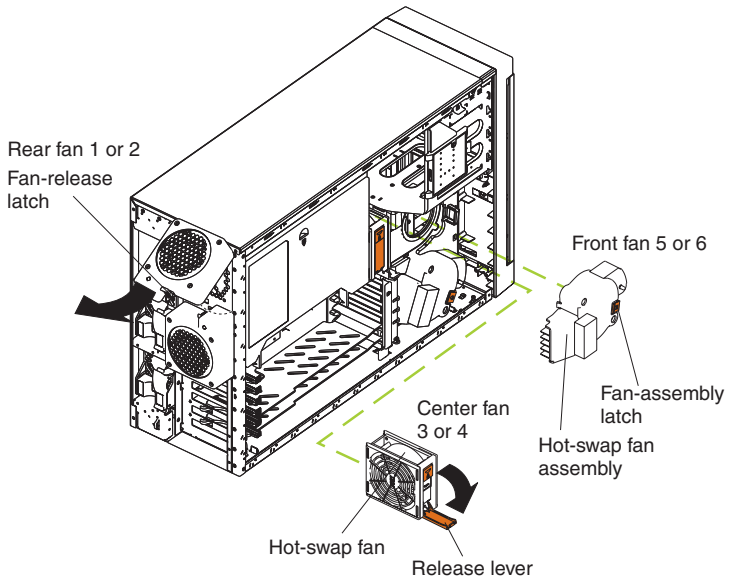
    Note: You can route the power cords through the power-cord restraint bracket on the rear of the server (tower model only).
11. If the server is not on, turn on the server.
12. Verify that the dc power LED and the ac power LED on each power supply are lit, indicating that the power supply is operating properly.

Replacing a hot-swap fan

Your server comes with six hot-swap fans: two front fans (fans 5 and 6), two center fans (fans 3 and 4), and two rear fans (fans 1 and 2). The two front fans are also known as blowers. You do not need to turn off the power to the server to replace a hot-swap fan.

Attention: To help ensure proper cooling, if a fan fails, replace it within 48 hours.

The following illustration shows how to replace hot-swap fans.



Determine which fan to replace by checking the LEDs on the fans. The front fans, center fans, and rear fans are installed differently from each other. This section contains separate instructions for each group of fans.

Replacing a front fan

Complete the following steps to replace front fan 5 or 6 (blower):

1. Review the information in "Installation guidelines" on page 45, "Handling static-sensitive devices" on page 46, and "Safety information" on page 169.
2. Remove the server cover (see "Removing the server left-side cover and bezel (tower model)" on page 55 or "Removing the server top cover and bezel (rack configuration)" on page 57).

   Attention: To ensure proper system cooling, do not remove the server cover for more than 30 minutes during this procedure.
3. Press the orange fan-release latch in the direction indicated by the arrow.
4. Pull the fan out of the server.
5. Align the two tabs on the replacement fan with the notches in the server and press the fan into the corresponding connector. Press the front edge of the fan to engage the latch fully and secure the fan in the server.
6. Verify that the FAN LED on the diagnostic LED panel (see "Light Path Diagnostics" on page 38) is not lit. If the FAN LED is lit, reseat the fan.
7. Reinstall the server cover (see "Installing the server bezel and left-side cover (tower model)" on page 100 or "Installing the server bezel and top cover (rack configuration)" on page 103).

Replacing a center fan

Complete the following steps to replace center fan 3 or 4:

1. Review the information in "Installation guidelines" on page 45, "Handling static-sensitive devices" on page 46, and "Safety information" on page 169.
2. Remove the server cover (see "Removing the server left-side cover and bezel (tower model)" on page 55 or "Removing the server top cover and bezel (rack configuration)" on page 57).

   Attention: To ensure proper system cooling, do not remove the server cover for more than 30 minutes during this procedure.
3. Press the orange fan-release latch in the direction indicated by the arrow; the latch will rotate downward.
4. Pull the fan out of the server.
5. Press the orange fan-release latch in the direction indicated by the arrow and open the latch; then, slide the replacement fan into the server. Press the latch up to snap it into place and secure the fan in the server.

   Note: When you slide the fan into the server, make sure the orange fan-release latch is at the top.
6. Verify that the FAN LED on the diagnostic LED panel (see "Light Path Diagnostics" on page 38) is not lit. If the FAN LED is lit, reseat the fan.
7. Reinstall the server cover (see "Installing the server bezel and left-side cover (tower model)" on page 100 or "Installing the server bezel and top cover (rack configuration)" on page 103).

Replacing a rear fan

Complete the following step to replace rear fan 1 or 2:

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Pull out on the orange fan-release latch on the rear fan bracket; then, lift the fan up and out of the hinge cutouts.
3. Touch an unpainted metal part of the server for at least 2 seconds; then, slide the replacement fan into the server. (Make sure that the fan fits correctly into the hinge cutouts on the rear of the server.)
4. When you have the fan properly seated, push on the fan-release latch until it clicks into place.
5. Verify that the FAN LED on the diagnostic LED panel (see “Light Path Diagnostics” on page 38) is not lit. If the FAN LED is lit, reseat the fan.

Replacing the battery

IBM has designed this product with your safety in mind. The lithium battery must be handled correctly to avoid possible danger. If you replace the battery, you must adhere to the following instructions.

Note: In the U. S., call 1-800-IBM-4333 for information about battery disposal.

If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.

To order replacement batteries, call 1-800-772-2227 within the United States, and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your IBM reseller or IBM marketing representative.

Note: After you replace the battery, you must reconfigure your server and reset the system date and time.

Statement 2:

CAUTION:

When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

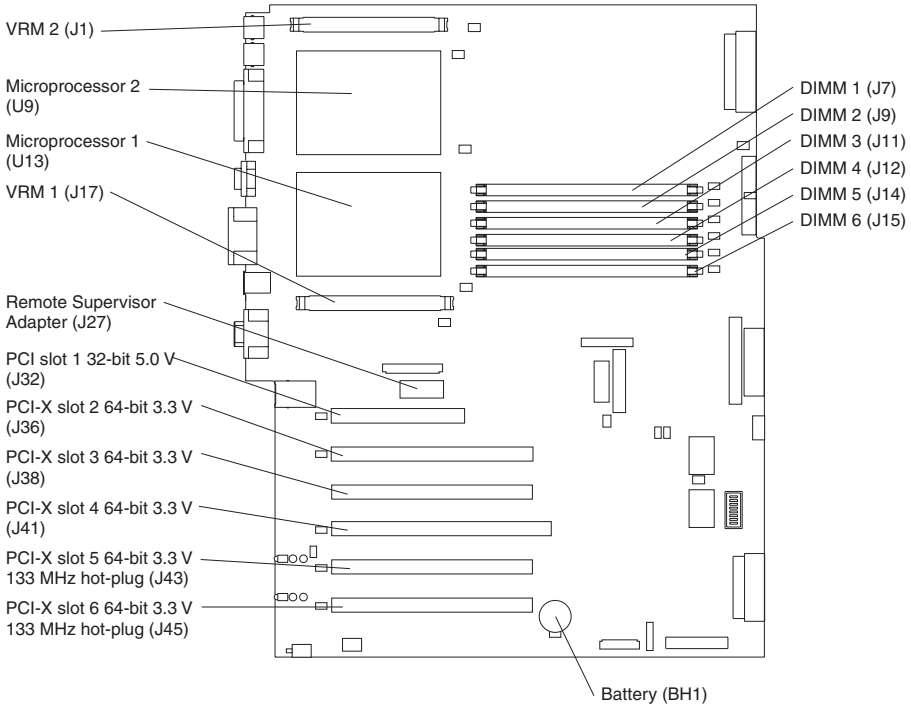
- **Throw or immerse into water.**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

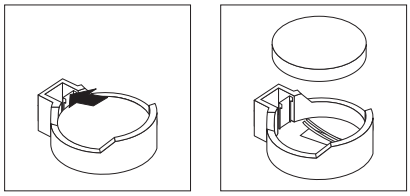
For further information on battery disposal, call IBM at 1-800-IBM-4333 (1-800-426-4333) in the U.S. For information outside of the U.S., contact an IBM reseller or marketing representative.

Complete the following steps to replace the battery:

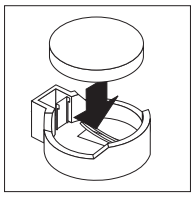
1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Follow any special handling and installation instructions supplied with the battery.
3. Turn off the server (see “Turning off the server” on page 9) and all attached devices and disconnect all power cords and external cables; then, remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 55 or “Removing the server top cover and bezel (rack configuration)” on page 57).
4. Lift the adapter-retention bracket on top of the adapter-support bracket; then, remove the full-length adapters and plastic dividers (see “Working with adapters” on page 60).
5. Remove the plastic shield covering the bottom portion of the system board.
6. Locate the battery (connector BH1) on the system board.

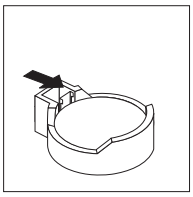

VRM 2 (J1)
Microprocessor 2 (U9)
Microprocessor 1 (U13)
VRM 1 (J17)
Remote Supervisor Adapter (J27)
PCI slot 1 32-bit 5.0 V (J32)
PCI-X slot 2 64-bit 3.3 V (J36)
PCI-X slot 3 64-bit 3.3 V (J38)
PCI-X slot 4 64-bit 3.3 V (J41)
PCI-X slot 5 64-bit 3.3 V 133 MHz hot-plug (J43)
PCI-X slot 6 64-bit 3.3 V 133 MHz hot-plug (J45)
DIMM 1 (J7)
DIMM 2 (J9)
DIMM 3 (J11)
DIMM 4 (J12)
DIMM 5 (J14)
DIMM 6 (J15)
Battery (BH1)

7. Remove the battery:
   a. Use one finger to press the top of the battery clip away from the battery until the battery releases upward from the socket.
   b. Lift and remove the battery from the socket.



8. Insert the new battery:
   a. Tilt the battery so that you can insert it into the socket on the side opposite the battery clip.
   b. Press the battery down into the socket until it clicks into place. Make sure the battery clip holds the battery securely.





9. Replace the plastic shield covering the bottom portion of the system board.
10. Reinstall the adapter-support bracket in the server (see “Removing and installing the adapter-support bracket” on page 58).

    Note: You must reinstall the air-baffle assembly when you reinstall the adapter-support bracket. Make sure that no cable is under the adapter-support bracket or interferes with the center fans.

    Important: To ensure proper cooling and server operation, you must keep the air-baffle cover closed.
11. Reinstall the adapters and plastic dividers that you removed, and reconnect the internal cables that you disconnected.
12. Reinstall the server cover (see “Installing the server bezel and left-side cover (tower model)” on page 100 or “Installing the server bezel and top cover (rack configuration)” on page 103).

    Note: You must wait approximately 20 seconds after you plug the power cord of your server into an electrical outlet before the power-control button becomes active.
13. Start the Configuration/Setup Utility program and set configuration parameters as needed (see “Starting the Configuration/Setup Utility program” on page 15).

Completing the installation

To complete your installation, you must reinstall the bezel, reinstall the server cover, reconnect all the cables that you disconnected earlier and, for certain options, run the Configuration/Setup Utility program. Follow the instructions in this section.

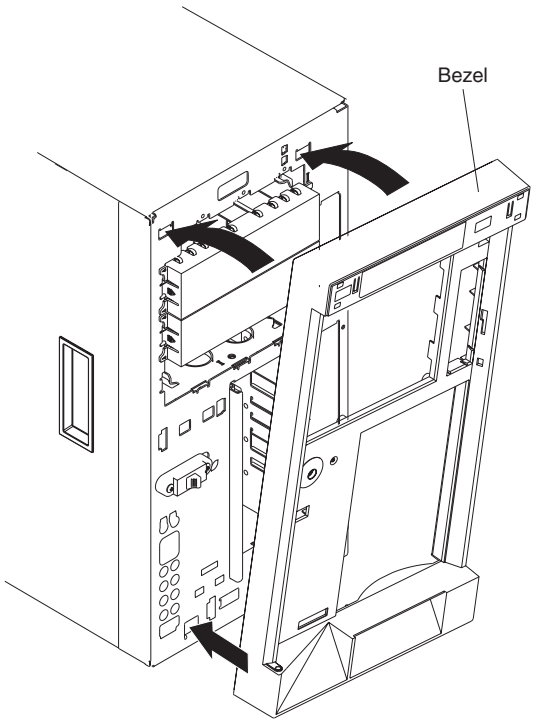
Attention:

- For proper cooling and airflow, replace the server cover before or shortly after turning on the server. Operating the server for extended periods of time (over 30 minutes) with the server cover removed might damage server components.
- To ensure proper server operation, do not remove the air-baffle assembly from the server except when installing or removing the components that are under the air-baffle cover.

Note: If you have just plugged the power cords of your server into electrical outlets, you will have to wait approximately 20 seconds before pressing the power-control button.

Installing the server bezel and left-side cover (tower model)

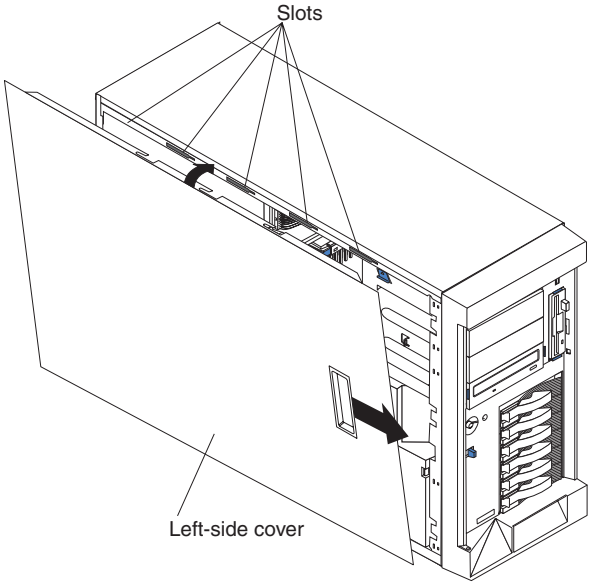
The following illustration shows how to install the bezel on the tower model server.



Complete the following steps to install the bezel:

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Insert the two tabs on the bottom of the bezel into the matching holes on the server chassis.
3. Push the top of the bezel toward the server until the two tabs at the top of the bezel snap into place.

The following illustration shows how to install the left-side cover on the tower model server.



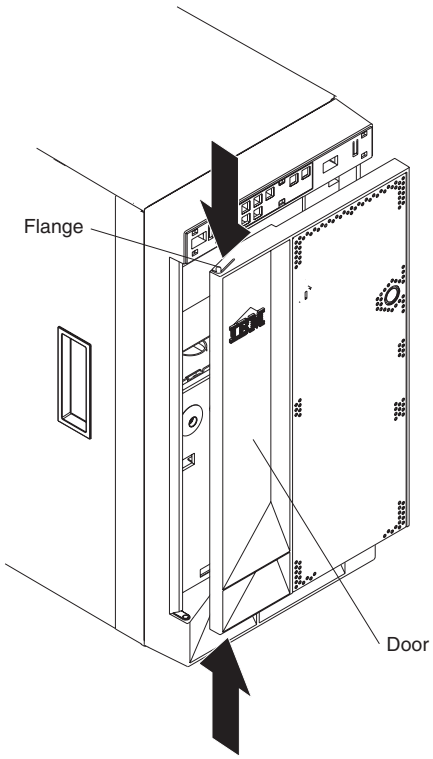
Complete the following steps to install the server left-side cover:

1. Before installing the cover, check that all cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server.
2. Place the bottom lip of the left-side cover over the bottom edge of the server chassis.
3. Rotate the left-side cover to a vertical position, inserting the tabs at the top of the left-side cover into the matching slots in the server chassis.
4. Slide the left-side cover forward until it locks in place.
5. If you disconnected any cables from the back of the server, reconnect the cables; then, plug the power cords into properly grounded electrical outlets.

Note: If necessary, see “Input/output connectors” on page 108 for connector locations.

Installing the server door (tower model)

The following illustration shows how to install the door on the server.



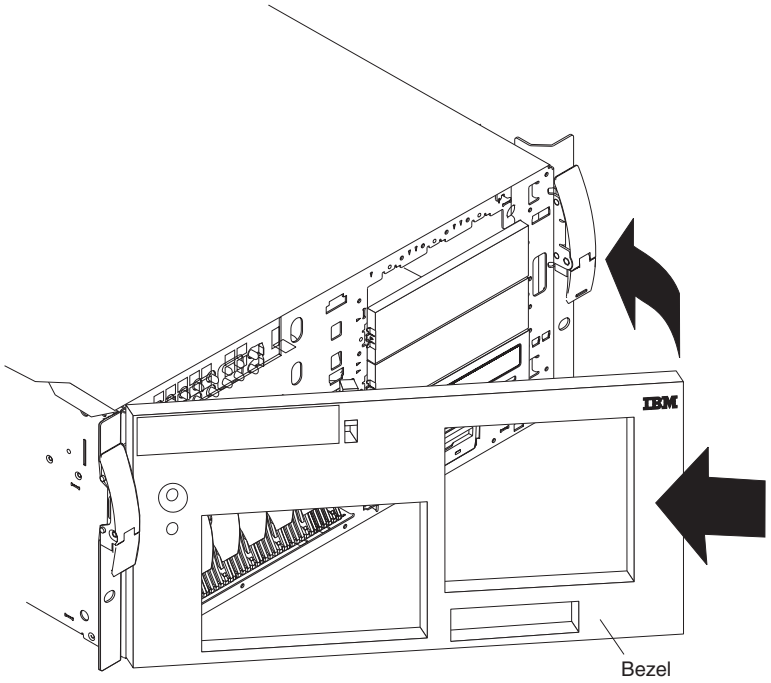
Complete the following steps to install the server door:

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Set the door on the bottom hinge.
3. Locate the flange on the top edge of the door.
4. Press the flange downward while pressing the top of the door toward the server until the flange connects with the top hinge. Release the flange.
5. Close the server door.

   Attention: Be sure to maintain a clearance of at least 100 mm (4 inches) on the front and rear of the server to allow for air circulation.

Installing the server bezel and top cover (rack configuration)

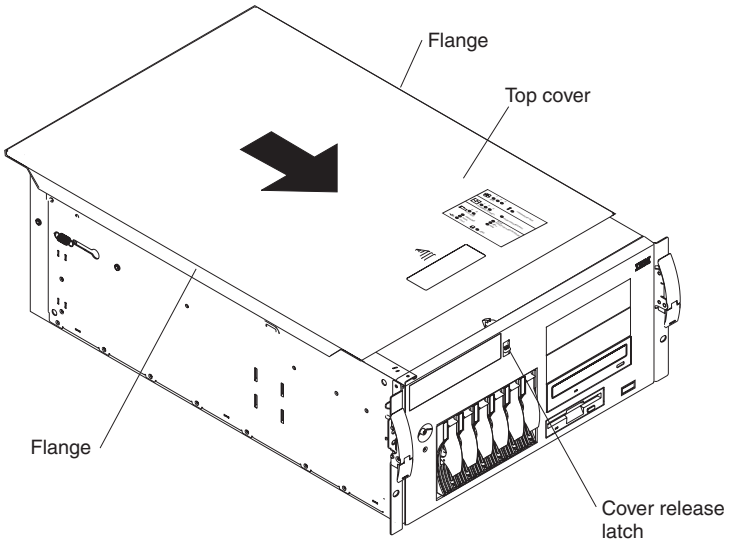
The following illustration shows how to install the bezel on a rack configuration server.



Complete the following steps to install the bezel:

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Insert the two tabs on the bottom of the bezel into the matching holes on the server chassis.
3. Push the top of the bezel toward the server until the two tabs at the top of the bezel snap into place.

The following illustration shows how to install the server top cover on a rack configuration server.



Complete the following steps to install the server top cover:

1. Before installing the cover, check that all cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server.
2. Place the cover-release latch in the open (up) position.
3. Place the lip of the left side of the top cover over the top-left edge of the server chassis.
4. Rotate the top cover to a horizontal position, inserting the tabs at the right side of the top cover into the matching slots in the server chassis.
5. Slide the top cover forward until it locks in place.
6. If you disconnected any cables from the back of the server, reconnect the cables; then, plug the power cords into properly grounded electrical outlets.

Note: If necessary, see “Input/output connectors” on page 108 for connector locations. The *Rack Installation Instructions* provided on the IBM *xSeries Documentation* CD also give additional rack installation and cabling information.

Updating your server configuration

When you start your server for the first time after you add or remove an internal option or an external SCSI device, you might see a message telling you that the configuration has changed. The Configuration/Setup Utility program automatically starts so that you can save the new configuration information (see “Starting the Configuration/Setup Utility program” on page 15).

Some options have device drivers that you need to install. See the documentation that comes with your option for information about installing any required device drivers.

Your server comes with one or two microprocessors installed on the system board. If your server comes with two microprocessors, or if your server comes with one microprocessor and you have installed an additional microprocessor, your server can now operate as an SMP server. Therefore, you might need to upgrade your operating system to support SMP. See the ServerGuide information (“Using the ServerGuide Setup and Installation CD” on page 22) and your operating-system documentation for additional information.

If your server has a RAID configuration using the integrated SCSI controller with RAID capabilities or has a ServeRAID controller installed and you have installed or removed a hard disk drive, see the ServeRAID documentation on the *IBM ServeRAID Support* CD for information about configuring your disk arrays.

Connecting external options

To attach external devices, you might need additional cables (see Chapter 7, “Parts listing for the xSeries 235”, on page 161).

If you install an optional SCSI adapter or use channel B on the integrated SCSI controller for external devices, you can attach external SCSI devices, such as a SCSI storage expansion enclosure, to your server. For a list of supported options for your server, go to http://www.ibm.com/pc/us/compat/ on the World Wide Web.

Note: See “Ultra320 SCSI system-board connectors” on page 110 for additional information about SCSI cabling and SCSI IDs.

If you plan to attach more than one external serial device, you must install the optional second serial port.

Installing the external SCSI connector

Complete the following steps to install the optional external SCSI connector needed to attach an external SCSI device:

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Turn off the server and disconnect all power cords and external cables (“Turning off the server” on page 9); then, remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 55 or “Removing the server top cover and bezel (rack configuration)” on page 57).

   Attention: To ensure proper system cooling, do not remove the server cover for more than 30 minutes during this procedure.
3. Remove the external SCSI knockout on the rear of the server (see “Cabling the server” on page 106 for external SCSI knockout location).
4. Follow the instructions that come with the option to prepare it for installation and to connect it to the server.
5. Route one end of the optional external SCSI cable to the external SCSI B connector (J51) on the system board (see “System-board internal cable connectors” on page 49 for the location of the SCSI connector); then, secure the external SCSI connector at the other end of the cable into the external SCSI knockout hole on the rear of the server.
6. Reinstall the server cover (see “Installing the server bezel and left-side cover (tower model)” on page 100 or “Installing the server bezel and top cover (rack configuration)” on page 103).
7. Reconnect all the devices, power cords, and cables that you disconnected; then, turn on the server and all attached devices.

Installing the second serial connector

Complete the following steps to install the optional second serial connector needed to attach more than one external serial device:

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Turn off the server and disconnect all power cords and external cables (“Turning off the server” on page 9); then, remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 55 or “Removing the server top cover and bezel (rack configuration)” on page 57).

   Attention: To ensure proper system cooling, do not remove the server cover for more than 30 minutes during this procedure.
3. Remove the optional serial connector knockout on the rear of the server (see “Cabling the server” on page 106 for external SCSI knockout location).
4. Route one end of the optional serial connector cable to the optional serial connector (J48) on the system board (see “System-board internal cable connectors” on page 49 for the location of the optional serial connector); then, secure the serial connector at the other end of the cable into the serial knockout hole on the rear of the server.
5. Reinstall the server cover (see “Installing the server bezel and left-side cover (tower model)” on page 100 or “Installing the server bezel and top cover (rack configuration)” on page 103).

6. Reconnect all the devices, power cords, and cables that you disconnected; then, turn on the server and all attached devices.

Connecting an external device

You can attach additional external options to the input/output (I/O) connectors on the front and rear of your server. (See “Input/output connectors” on page 108 for more information.)

Complete the following steps to attach an external device:

1. Review the information in “Installation guidelines” on page 45, “Handling static-sensitive devices” on page 46, and “Safety information” on page 169.
2. Turn off the server and all attached devices.
3. Follow the instructions that come with the option to prepare it for installation and to connect it to the server.

Cabling the server

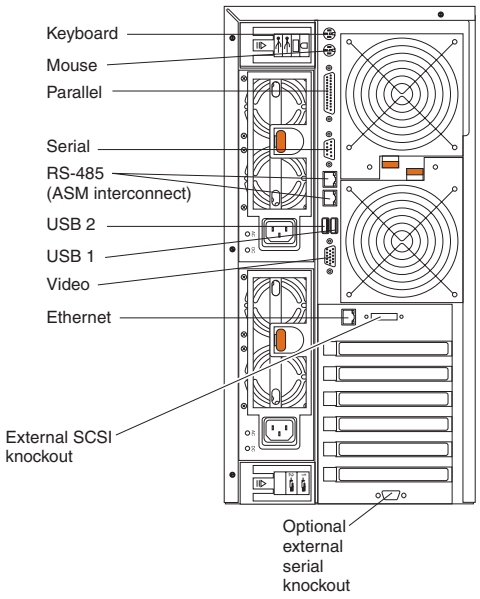
Notes:

1. You must turn off the server before connecting any cables to or disconnecting any cables from the server.
2. See the documentation that comes with your options for additional cabling instructions. It might be easier for you to route cables before you install certain options.
3. Cable identifiers are printed on the cables that come with your server and options. Use these identifiers to connect the cables to the correct connectors. For example, the hard disk drive cables are labeled “HDD option.”

Two cable-restraint brackets are on the rear of the tower model servers. After you connect the cables to the selected devices, you can use these cable-restraint brackets to manage the cable routing. Route the power cords through the power-cord restraint bracket on the bottom. Route the remaining cables (for example, the cables that are connected to the I/O ports) through the I/O cable-restraint bracket on the top.

See the following illustrations for the locations of the input and output connectors on your server.

Note: The USB 3 connector is on the front of the server.



Keyboard cabling

There is one keyboard port on the back of the server. Connect a keyboard to this port.

Pointing device cabling

There is one pointing device port on the back of the server. Connect a pointing device to this port.

Parallel port cabling

There is one parallel port on the back of the server. You can connect a parallel device to this port.

Serial cabling

Your server has one standard serial port on the back of the server and one optional serial port (shipped with the server). You can connect a serial devices to these ports.

Advanced System Management Interconnect cabling

There are two Advanced System Management (ASM) Interconnect ports on the back of the server. Use these ports to connect the server to a Remote Supervisor Adapter in a remote server. The ports support full asynchronous RS-485 communication through a daisy-chain cable in half-duplex mode. Both ports have automatic termination, and either port can be used if your server is at the beginning or end of an RS-485 network.

Notes:

1. Do not confuse the two ASM Interconnect ports that are next to the video port with the Gigabit Ethernet port.
2. If you install an optional Remote Supervisor Adapter in your server, use the RS-485 ports on the Remote Supervisor Adapter and not the integrated RS-485 ports on the back of your server.

USB cabling

There are three USB ports, one on the front and two on the back of the server. You can connect USB devices to these ports.

Video cabling

There is one video port on the back of the server. Connect a monitor to this port.

Gigabit Ethernet cabling

There is one Ethernet port on the back of the server. Use this port to connect the server to a LAN.

Note: Do not confuse the Gigabit Ethernet port with the two ASM Interconnect ports that are next to the video port.

Power cabling

Your server comes with one or two power cords that you can connect to an uninterruptible power supply or to an external source, such as a properly grounded electrical outlet.

Complete the following steps to attach the power supply power cords:

1. Connect each power-supply cord to one of the system power connectors on the rear of the server.
2. Plug the other end of each power-supply cord into a properly grounded electrical outlet or uninterruptible power supply.

   Note: Plugging the power-supply cords into electrical outlets might cause the server to start automatically. This is an acceptable action.
3. See “Turning on the server” on page 8 for detailed information about turning on the server.

Installing the server in a rack

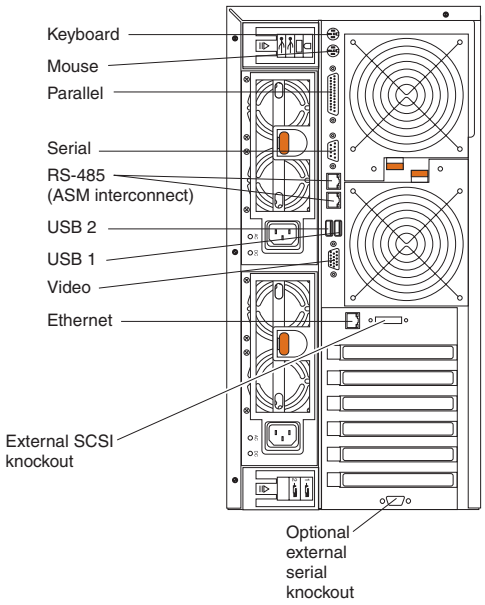
Detailed cabling instructions for a typical rack server configuration are provided on the IBM *xSeries Documentation CD* that come with your server. These instructions also come with the Tower-to-Rack Conversion Kit.

Input/output connectors

This section provides information about the following I/O ports on your server. Most of these ports are on the rear of your server.

- One parallel port
- One video port
- One keyboard port
- One auxiliary-device port (pointing device) port
- Two Ultra320 SCSI connectors on the system board
- One serial port (second serial port optional)
- Three Universal Serial Bus (USB) version 1.1 ports (USB 1 and USB 2 on the rear, USB 3 on the front)
- One Ethernet port
- Two RS-485 (ASM interconnect) ports dedicated to the system service processor

The following illustration shows the I/O port connectors on the rear of your server.



Two cable-restraint brackets are on the tower model on the rear of the server. After you connect the cables to the selected devices, you can use these cable-restraint brackets to manage the cable routing. Route the power cords through the power-cord restraint bracket on the bottom. Route the remaining cables (for example, the cables that are connected to the I/O ports) through the I/O cable-restraint bracket on the top.

Parallel port

Your server has one parallel port. This port supports three standard Institute of Electrical and Electronics Engineers (IEEE) 1284 modes of operation: Standard Parallel Port (SPP), Enhanced Parallel Port (EPP), and Extended Capability Port (ECP).

Viewing or changing the parallel-port assignments

You can use the built-in Configuration/Setup Utility program to configure the parallel port as bidirectional; that is, so that data can be both read from and written to a device. In bidirectional mode, the server supports the ECP and EPP modes.

To view or change the parallel-port assignment:

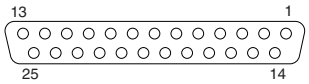
1. Restart the server and watch the monitor screen.
2. When the message `Press F1 for Configuration/Setup` appears, press F1.

   Note: The **Devices and I/O Ports** choice appears only on the full configuration menu. If you set two levels of passwords, you must type the administrator password to access the full configuration menu.
3. From the main menu, select **Devices and I/O Ports**; then, press Enter.
4. Select the parallel port; then, use the arrow keys to advance through the available settings.

   Note: When you configure the parallel port as bidirectional, use an IEEE 1284-compliant cable. The maximum length of the cable must not exceed 3 meters (9.8 ft).
5. Select **Save Settings**; then, select **Exit Setup** to exit from the Configuration/Setup Utility main menu.

Parallel port connector

The following illustration shows the 25-pin, female D-shell parallel-port connector on the rear of your server. This connector conforms to the industry standard.

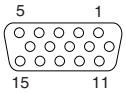


Video port

Your server comes with an integrated super video graphics array (SVGA) video controller. This controller is not removable, but you can disable it through the Configuration/Setup Utility program or by installing a PCI video adapter.

Note: If you install a PCI video adapter, the server BIOS will automatically disable the integrated video controller.

The following illustration shows the 15-pin analog video connector on the rear of your server. This connector conforms to the industry standard.

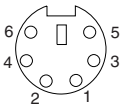


Keyboard port

There is one keyboard connector on the rear of your server.

Note: If you attach a standard (non-USB) keyboard to the keyboard connector, the USB ports and devices will be disabled during the power-on self-test (POST).

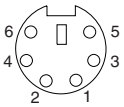
The following illustration shows the keyboard connector on the rear of your server. This connector conforms to the industry standard for a PS/2® keyboard.



Auxiliary-device (pointing device) port

The system board has one auxiliary-device port that supports a mouse or other pointing device.

The following illustration shows the auxiliary-device connector on the rear of your server. This connector conforms to the industry standard for a PS/2 pointing device.



Ultra320 SCSI system-board connectors

Your server has an integrated dual-channel Ultra320 small computer system interface (SCSI) controller. This controller supports two independent, internal Ultra320 SCSI channels. The SCSI channel connectors are on the system board. Each channel supports up to 15 SCSI devices. This controller uses:

- Double-transition clocking to achieve up to 320 MB-per-second data-transfer rates
- Domain name validation to negotiate compatible data-transfer speeds with each device
- Parity checking to ensure data reliability
- An active terminator for SCSI bus termination

The server comes with one SCSI cable that is connected from the internal SCSI channel A connector to the standard hot-swap-drive backplane. You can attach additional internal SCSI devices to the other internal SCSI channel B connector, or you can use channel B for external SCSI devices. To use channel B for external SCSI devices, remove the external SCSI knockout from the rear of the server (see "Cabling the server" on page 106 for external SCSI knockout location) and secure the free end of an optional channel B cable in the new opening.

If you want to attach external SCSI devices to the server without using the internal SCSI channel B, you must install an optional SCSI adapter.

Notes:

1. External SCSI devices connected to internal SCSI channel B will operate asynchronously.
2. If you install a PCI RAID adapter to configure and manage the internal hot-swap drives, you must move the SCSI cable from the system-board SCSI connector to an internal channel connector on the RAID adapter (except for the ServeRAID-5i controller, which uses the system-board integrated SCSI controller with RAID capabilities). See "Cabling example for a ServeRAID controller" on page 66 for additional information.

Note: If you install a PCI RAID adapter to configure and manage the internal hot-swap drives, you must move the SCSI cable from the system-board SCSI connector to an internal channel connector on the RAID adapter (except for the ServeRAID-5i controller, which uses the system-board integrated SCSI controller with RAID capabilities). See "Cabling example for a ServeRAID controller" on page 66 for additional information.

SCSI cabling requirements

For information about the maximum length of SCSI cable, see the American National Standards Institute (ANSI) SCSI standards on the ANSI Web site at http://www.ansi.org/ on the World Wide Web. Adhering to these standards will help to ensure that your server operates properly.

SCSI IDs

Each SCSI device that is connected to a SCSI controller must have a unique SCSI ID. This ID enables the SCSI controller to identify the device and ensure that different devices on the same SCSI channel do not attempt to transfer data simultaneously. SCSI devices that are connected to different SCSI channels can have duplicate SCSI IDs. Table 8 on page 112 and Table 9 on page 112 list the SCSI IDs for the hard disk drives and backplanes that are connected to one channel. In the typical configuration, the standard hard disk drives and backplane are connected to channel A, and the optional 3-Pack hard disk drives and backplane are connected to channel B. See "Working with the 3-Pack Ultra320 Hot-Swap Expansion option" on page 70 for instructions for installing the 3-Pack option, and "Installing internal drives" on page 74 for instructions about installing hard disk drives.

Table 8. SCSI IDs for standard hot-swap hard disk drives and backplane

Device	SCSI ID
Drive bay 5	5
Drive bay 4	4
Drive bay 3	3
Drive bay 2	2
Drive bay 1	1
Drive bay 0	0
Backplane	8

Table 9. SCSI IDs for optional 3-Pack hot-swap hard disk drives and backplane

Device	SCSI ID
Drive bay 14	14
Drive bay 13	13
Drive bay 12	12
Backplane	9

The hot-swap-drive backplane controls the SCSI IDs for the internal hot-swap drive bays. However, when you attach an external SCSI device to an optional SCSI adapter, you must set a unique ID for the device. See the information that comes with the device for instructions to set its SCSI ID.

SCSI connectors

The following illustration shows the 68-pin, female D-shell SCSI connectors. These connectors conform to the SCSI standard.

Serial ports

Your server has one standard serial port that the operating system can use and one optional serial port.

Some application programs require specific ports, and some modems function properly only at certain communication-port addresses. You might need to use the Configuration/Setup Utility program to change communication-port address assignments to prevent or resolve address conflicts.

Viewing or changing the serial-port assignments

To view or change the serial-port assignments:

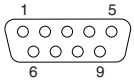
1. Restart the server and watch the monitor screen.
2. When the message `Press F1 for Configuration/Setup` appears, press F1.
3. From the main menu, select **Devices and I/O Ports**; then, press Enter.

   Note: The **Devices and I/O Ports** choice appears only on the full configuration menu. If you set two levels of passwords, you must type the administrator password to access the full configuration menu.

4. Select the serial port; then, use the arrow keys to advance through the settings available.
5. Select **Save Settings**; then, select **Exit Setup** to exit from the Configuration/Setup Utility main menu.

Serial-port connectors

The following illustration shows the 9-pin, male D-shell serial-port connector on the rear of your server. This connector conforms to the industry standard.



Universal Serial Bus version 1.1 ports

Your server has one Universal Serial Bus (USB) version 1.1 connector on the front of the server and two USB version 1.1 connectors on the rear of the server.

USB is a serial interface standard for telephony and multimedia devices. It uses Plug and Play technology to determine the type of device that is attached to the connector.

Notes:

1. If you attach a standard (non-USB) keyboard to the keyboard connector, the USB ports and devices will be disabled during the power-on self-test (POST).
2. If you install a USB keyboard that has a mouse port, the USB keyboard emulates a mouse, and you will not be able to disable the mouse settings in the Configuration/Setup Utility program.
3. Check to make sure that your NOS supports USB devices.
4. For additional information about USB version 1.1 devices, go to http://www.usb.org/.

USB cables and hubs

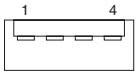
You need a 4-pin cable to connect USB devices. If you plan to attach more than three USB devices, you must use a hub to connect the devices. The hub provides multiple connectors for attaching additional external USB devices.

USB technology provides up to 12 Mb-per-second (Mbps) speed with a maximum of 127 devices and a maximum cable length of five meters (16 ft).

USB-port connectors

Each USB port has an external connector on the front and rear of the server for attaching USB compatible devices.

The following illustration shows the USB-port connectors on the front and rear of your server. These connectors conform to the USB version 1.1 standard.



Gigabit Ethernet port

Your server comes with an integrated Gigabit Ethernet controller. This controller provides an interface for connecting to 10-Mbps, 100-Mbps, or 1000-Mbps networks and provides full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the Ethernet local area network (LAN).

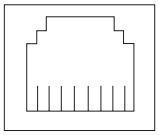
To access the Ethernet connector, connect a Category 3, 4, or 5 unshielded twisted-pair (UTP) cable to the Ethernet (RJ-45) connector on the rear of your server. See “System-board external port connectors” on page 50.

Note: The 100BASE-TX Fast Ethernet standard and1000BASE-T standard require that the cabling in the network be Category 5 or higher.

The Ethernet (RJ-45) connector has one LED that indicates Ethernet-link status. When this green LED is on, there is an active connection on the Ethernet port. Activity between the server and the network is indicated by the Ethernet transmit/receive activity LED on the front of the server (see “Operator information panel” on page 7).

Ethernet connector

There is an RJ-45 Ethernet connector on the back of the server. See “System-board external port connectors” on page 50 for the location of this connector. The following illustration shows the pin-number assignments for the RJ-45 connector. These assignments apply to both 10BASE-T and 100/1000BASE-TX devices.



RS-485 (ASM interconnect) ports

The RS-485 connectors are used for the ISMP interconnect function. The ISMP interconnect function uses these connectors to daisy-chain several system service processors together. This function enables the service processors to communicate with each other in half-duplex mode.

Chapter 5. Service replaceable units

This chapter describes the removal of server components.

Important: The field replaceable unit (FRU) procedures are intended for trained servicers who are familiar with IBM xSeries products. See the parts listing in “System” on page 162 to determine if the component being replaced is a customer replaceable unit (CRU) or a FRU.

Thermal grease

This section contains information about removing and replacing the thermal grease between the heat sink and the microprocessor. The thermal grease must be replaced anytime the heat sink has been removed from the top of the microprocessor and is going to be reused, or when debris is found in the grease.

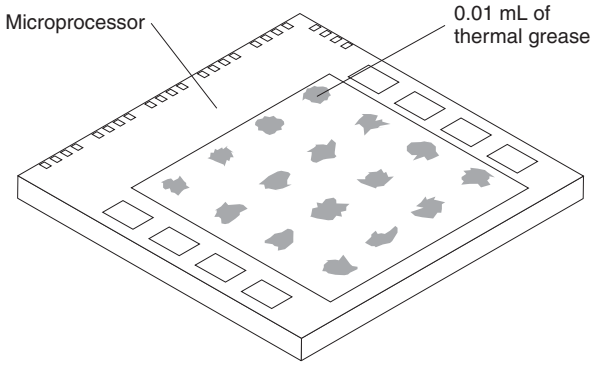
Note:

- Read “Installation guidelines” on page 45.
- Read the safety notices at “Safety information” on page 169.
- Read “Handling electrostatic discharge-sensitive devices” on page 172.

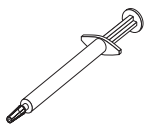
Complete the following steps to replace damaged or contaminated thermal grease on the microprocessor and heat sink:

1. Place the heat sink on a clean work surface.
2. Remove the cleaning pad from its package and unfold it completely.
3. Use the cleaning pad to wipe the thermal grease from the bottom of the heat sink.

   Note: Be sure that all of the thermal grease is removed.
4. Use a clean area of the cleaning pad to wipe the thermal grease from the microprocessor; then, dispose of the cleaning pad after all of the thermal grease is removed.



5. Use the thermal grease syringe to place 16 uniformly spaced dots of 0.01mL each on the top of the microprocessor.



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Note: 0.01mL is one tick mark on the syringe. If the grease is properly applied, approximately half (0.22mL) of the grease will remain in the syringe.

6. Install the heat sink onto the microprocessor as described in “Installing an additional microprocessor” on page 83.

System board

Note:

- Read “Installation guidelines” on page 45.
- Read the safety notices at “Safety information” on page 169.
- Read “Handling electrostatic discharge-sensitive devices” on page 172.

Attention:

Complete the following steps to remove the system board.

1. Turn off the server and any attached devices.

   Notes:

   a. When replacing the system board, you must either update the system with the latest firmware or restore the pre-existing firmware that the customer provides on a diskette or CD image.

   b. When replacing the system board in a server designed for 400 MHz microprocessors, do not install a system board designed for microprocessors of greater than 400 MHz (see Chapter 7, “Parts listing for the xSeries 235”, on page 161).

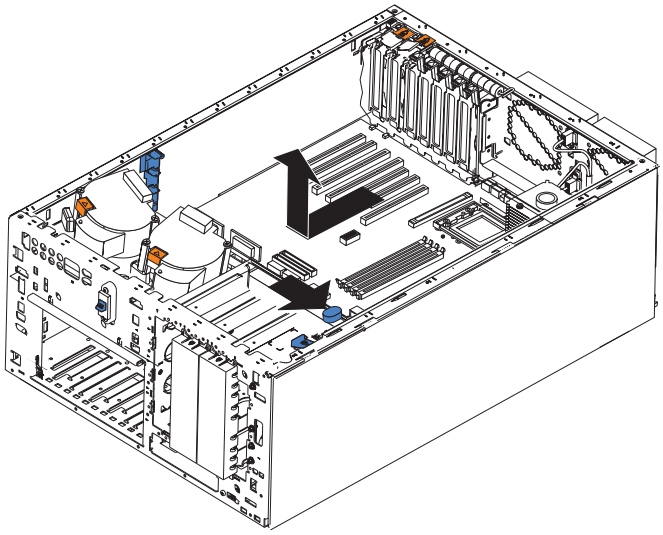
2. Disconnect external cables and option cables from the back of the server.
3. Lay the server so that the cover is facing up.
4. Remove the cover (see “Removing the left-side cover” on page 55).
5. Disconnect and remove adapters and spacers (see “Working with adapters” on page 60).
6. Remove the two central fans (see “Replacing a hot-swap fan” on page 95).
7. Remove the plastic baffle.
8. Remove the adapter support bracket (see “Removing and installing the adapter-support bracket” on page 58).
9. Disconnect all cables from the system board.

   Note: Place all disconnected cables carefully to the side so that they do not come in contact with the center of the system board.

10. Remove all microprocessors and VRMs and set them aside on a static-protected surface for reinstallation (see “Microprocessor removal” on page 117).
11. Remove the memory modules and set them aside on a static-protected surface for reinstallation (see “Installing memory modules” on page 80).

    Note: When you set the DIMMs aside, be sure to keep track of the slots they belong to; DIMMs must be installed in pairs of the same size, speed,

type, and technology.



12. Push the system-board release latch toward the side of the system board where the DIMM slots are located to release the board.

    Note: The board will not be released until the latch is pushed to be approximately parallel with the DIMM slots.

13. Pull the board carefully out of the server.
14. To reinstall the board, place it carefully into position in the chassis with the system-board release lever in the open position; then, slide the lever toward the side of the system board where the adapters are installed until the board is securely in place.
15. Reverse steps 5 on page 116 through 11 on page 116 to replace the components that were removed.

    Note: When reassembling the components in the server, be sure to route all cables carefully so that they are not exposed to undue pressure.

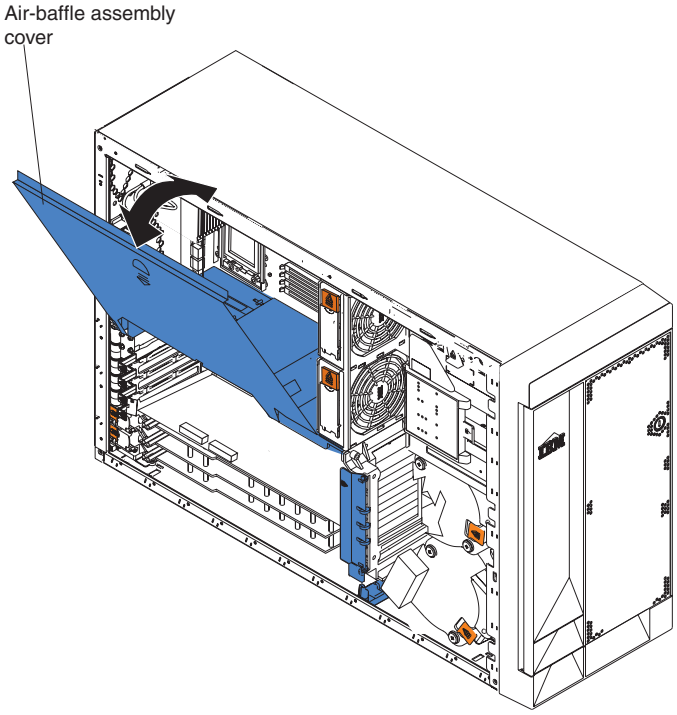
Microprocessor removal

Complete the following steps to remove a microprocessor.

Note:

- Read “Installation guidelines” on page 45.
- Read the safety notices at “Safety information” on page 169.
- Read “Handling electrostatic discharge-sensitive devices” on page 172.

1. Turn off the server and disconnect all power cords and external cables; then, remove the server cover (see “Removing the left-side cover” on page 55).
2. Open the cover on the air-baffle assembly.



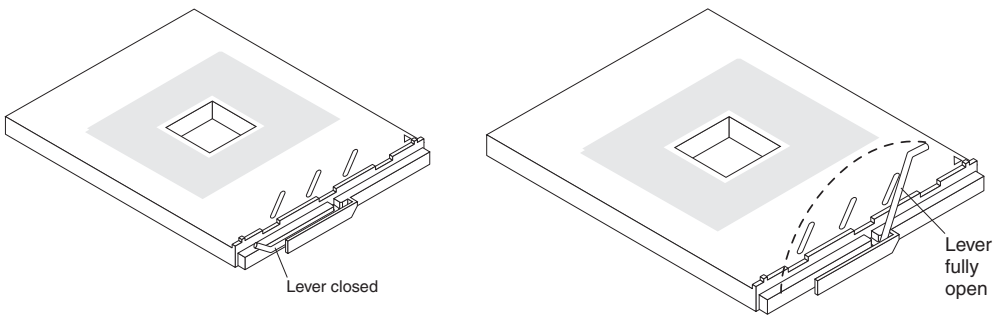
Note: It might be easier to turn the server on its side and remove the air baffle to access the microprocessors.

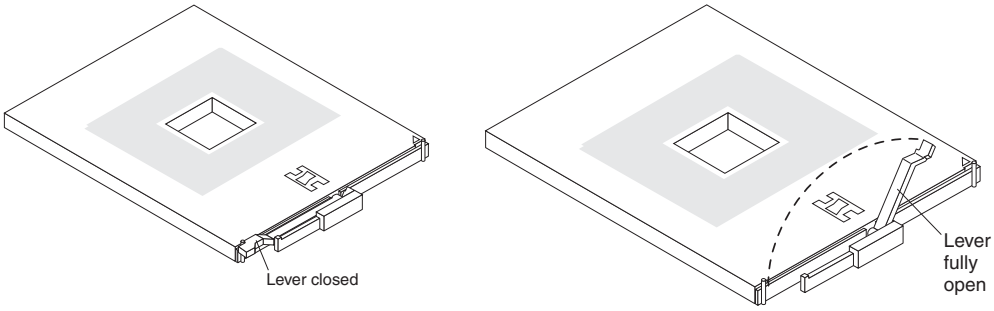
3. Identify the microprocessor to be removed.
4. Remove the heat sink:
   a. Loosen one captive screw fully; then, loosen the other captive screw.

      Attention: Loosening one screw fully before loosening the other screw will help to break the thermal bond that adheres the heat sink to the microprocessor.

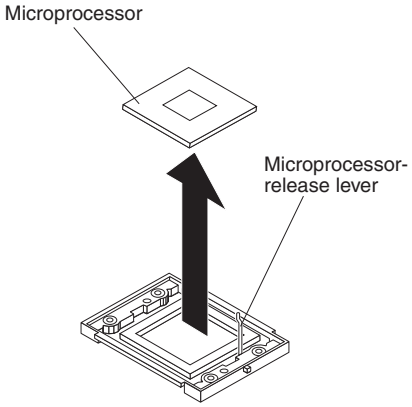
   b. Pull the heat sink off of the microprocessor.
5. Rotate the locking lever on the microprocessor socket from its closed and locked position until it stops or clicks in the fully open position (approximately 135° angle), as shown. Then, see the documentation provided with the microprocessor option for complete installation instructions.

   Attention: You must ensure that the locking lever on the microprocessor socket is in the fully open position before you insert the microprocessor in the socket. Failure to do so might result in permanent damage to the microprocessor, microprocessor socket, and system board.





6. Pull the microprocessor out of the socket.



To install a microprocessor, see “Installing an additional microprocessor” on page 83.

Operator information panel

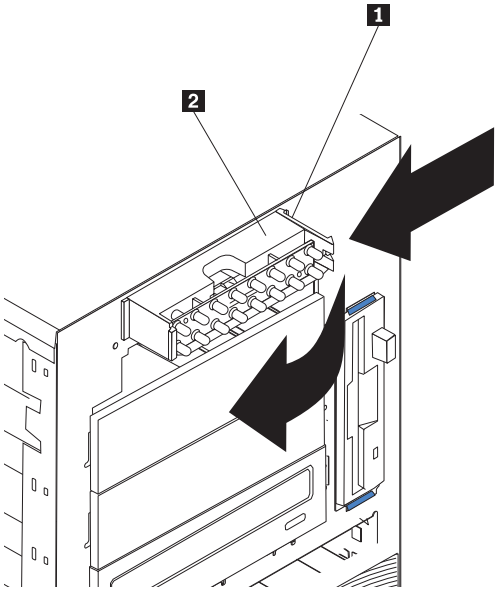
Complete the following steps to remove the operator information panel.

Note:

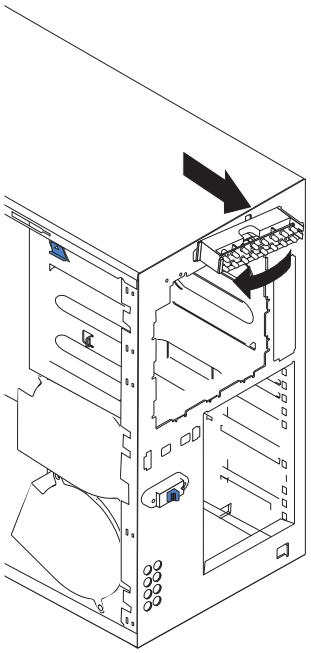
- Read “Installation guidelines” on page 45.
- Read the safety notices at “Safety information” on page 169.
- Read “Handling electrostatic discharge-sensitive devices” on page 172.

1. Turn off the server and any attached devices.
2. Disconnect all external cables and power cords from the back of the server.
3. Remove the server cover (see “Removing the left-side cover” on page 55).
4. Remove the front bezel (see “Removing the bezel” on page 56).
5. Disconnect and remove adapters and spacers (see “Working with adapters” on page 60).
6. Remove the two central fans (see “Replacing a hot-swap fan” on page 95).
7. Remove the plastic baffle.

8. Disconnect the operator information panel cable from the system board.



9. From outside the server, push the tab **1** on the panel **2**, making sure to press the tab near the chassis; the panel will disengage from the chassis.



10. Remove the panel, carefully threading the cable past the other components and through the opening in the chassis.

    Note: If the cable has been secured in the cable clamps, gently pull it out of the clamps before pulling the cable through the opening in the chassis.

11. To install the operator information panel, reverse the previous steps.

    Notes:

    a. Thread the cable through the opening in the chassis and extend it into the server before attaching the operator information panel.

    b. Secure the cable in the cable clamps along the inside of the chassis.

c. Fit the left tab (in the rack configuration, this is the top tab) into the lip on the chassis, and then press on the right tab (in the rack configuration, this is the bottom tab) until it snaps into place.

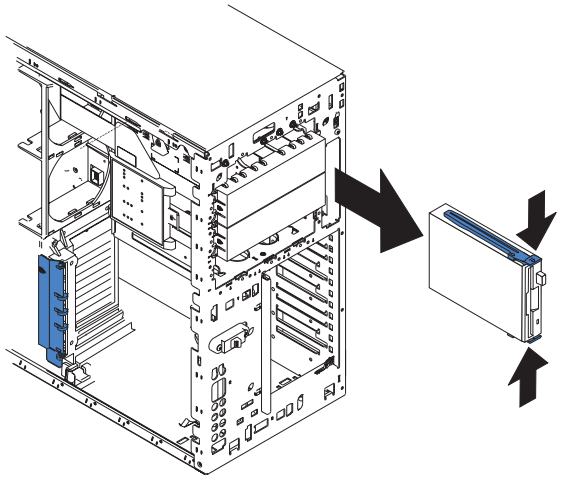
Diskette drive

Complete the following steps to remove the diskette drive.

Note:

- Read “Installation guidelines” on page 45.
- Read the safety notices at “Safety information” on page 169.
- Read “Handling electrostatic discharge-sensitive devices” on page 172.

1. Turn off the server and all attached devices.
2. Disconnect all external cables and power cords from the back of the server.
3. Remove the server cover (see “Removing the left-side cover” on page 55).
4. Remove the front bezel (see “Removing the bezel” on page 56).



5. Press in on the two blue diskette drive release tabs until the drive is released from the chassis.
6. Carefully pull the drive away from the chassis until the cables at the rear of the drive are accessible.
7. Remove the two cables from the back of the drive and pull the drive out.
8. To replace the diskette drive, reverse the previous steps.

   Note: If you are replacing the drive, prepare the new drive for the server with the following procedure:

   a. Remove the side rails from the drive by gently pulling them away from the drive until they detach.
   b. Insert one pin of the rail into the notch near the rear of the drive.
   c. Pushing the rail gently toward the rear of the drive, insert the other pin into the notch near the front of the drive.
   d. Press in on the metal strip in the rail to secure the rail to the drive.

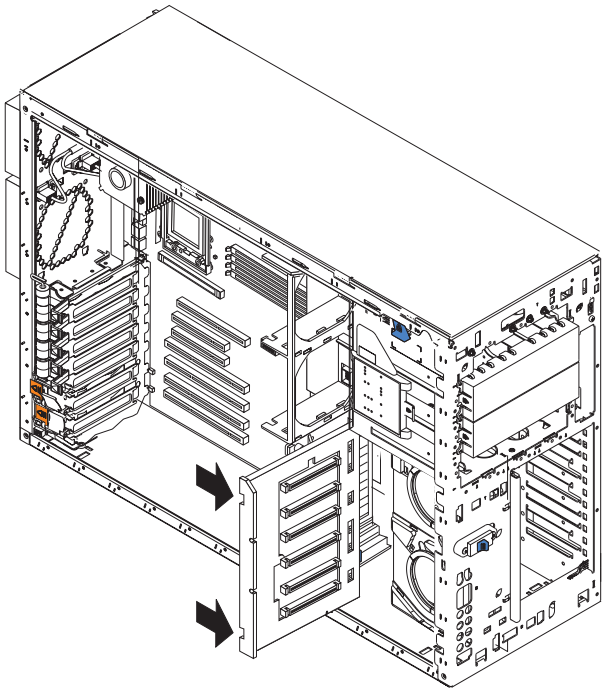
DASD backplane

Complete the following steps to remove the DASD backplane.

Note:

- Read “Installation guidelines” on page 45.
- Read the safety notices at “Safety information” on page 169.
- Read “Handling electrostatic discharge-sensitive devices” on page 172.

1. Turn off the server.
2. Disconnect all external cables and power cords from the back of the server.
3. Pull out the hard drives.
4. Remove the server cover (see “Removing the left-side cover” on page 55).
5. Remove the two front fans (see “Replacing a hot-swap fan” on page 95).
6. Disconnect and remove adapters and spacers (see “Working with adapters” on page 60).
7. Remove the two central fans (see “Replacing a hot-swap fan” on page 95).
8. Remove the plastic baffle.
9. Disconnect the DASD cable from the DASD backplane.



10. Press the release latches and pull the backplane out of the server.
11. To replace the DASD backplane, reverse the previous steps, making sure to place the backplane assembly over the two guide pins on the chassis floor.

Power-supply (non-hot-swap)

Complete the following steps to remove the non-hot-swap power supply.

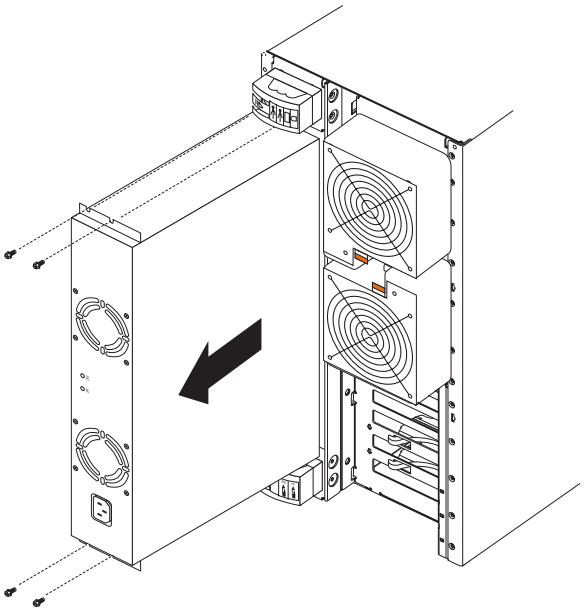
Note:

- Read “Installation guidelines” on page 45.
- Read the safety notices at “Safety information” on page 169.
- Read “Handling electrostatic discharge-sensitive devices” on page 172.

1. Turn off the server.

   Note: If your server is a tower model, you might find it easier to install the hot-swap power-supply option if you turn the server on its side so that the power supply is on the bottom.

2. Disconnect all external cables and power cords from the back of the server.
3. Remove the adapter-support bracket. See “Removing and installing the adapter-support bracket” on page 58 for instructions.
4. Remove the fixed power supply (see the following illustration).



5. Disconnect all power-supply cables from the system board (J4, J10), SCSI backplane, and other backplanes or devices.
6. From the rear of the server, remove the two screws at each side of the fixed power supply.
7. Gently pull the power supply from the server, making sure the cables do not snag on the chassis or system board.

   Note: You might need to insert the blade of a screwdriver behind one corner of the power supply to begin moving it.

8. To install a non-hot-swap power supply option, reverse the previous steps.

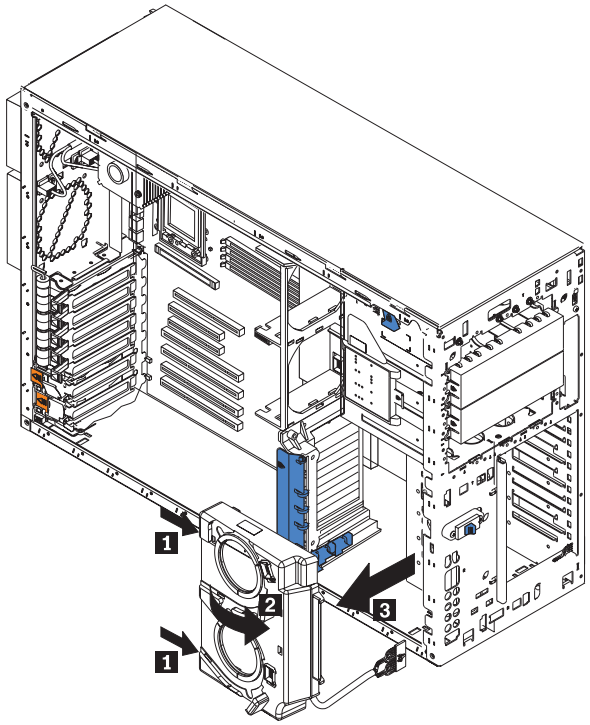
Front fan housing

Complete the following steps to remove the blower housing.

Note:

- Read “Installation guidelines” on page 45.
- Read the safety notices at “Safety information” on page 169.
- Read “Handling electrostatic discharge-sensitive devices” on page 172.

1. Turn off the server.
2. Disconnect all external cables and power cords from the back of the server.
3. Remove the front bezel (see “Removing the bezel” on page 56).
4. Remove the server cover (see “Removing the left-side cover” on page 55).
5. Remove the two front fans (see “Replacing a hot-swap fan” on page 95).
6. Disconnect and remove adapter cards and spacers (see “Working with adapters” on page 60).
7. Remove the two central fans (see “Replacing a hot-swap fan” on page 95).
8. Remove the plastic baffle.
9. Remove the DASD backplane (see “DASD backplane” on page 122).
10. Disconnect the fan cable from the system board.



11. Press in the tabs (1) with the tip of a flat-blade screwdriver until the housing releases and tilts up (2); then, pull the housing out of the two notches on the front of the chassis and lift (3) the housing out of the server.
12. To replace the blower housing, reverse the previous steps, making sure that the two tabs are inserted into the notches on the front of the chassis.

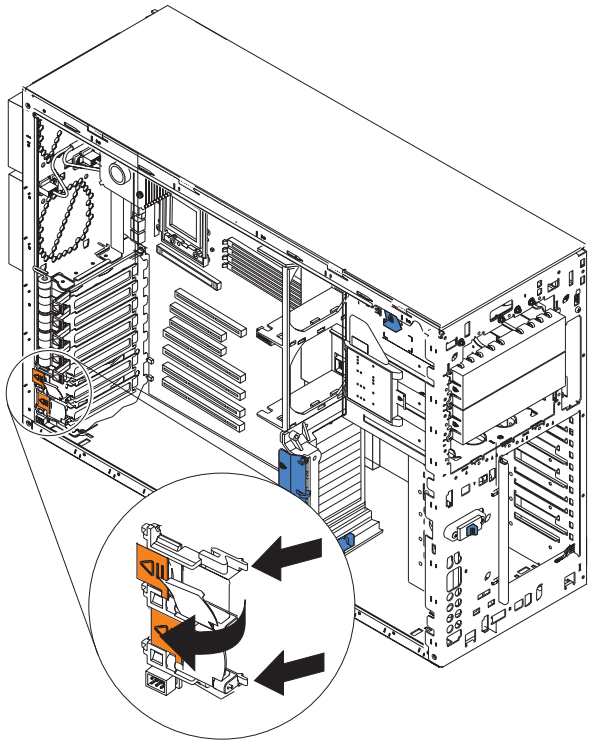
Hot-swap card

Complete the following steps to remove the hot-swap card.

Note:

- Read “Installation guidelines” on page 45.
- Read the safety notices at “Safety information” on page 169.
- Read “Handling electrostatic discharge-sensitive devices” on page 172.

1. Turn off the server.
2. Disconnect all external cables and power cords from the back of the server.
3. Remove the server cover (see “Removing the left-side cover” on page 55).
4. Remove all adapters and spacers (see “Working with adapters” on page 60).
5. Disconnect the hot-swap card cable from the system board.



6. Press the two tabs on the hot-swap card and remove it from the chassis.

   Note: It might be easier to remove this component if the server is placed on its side.

7. To replace the hot-swap card, line up the two tabs with the notches on the chassis and snap the assembly into place; then, connect the cable to the system board.

Diagnostics panel card

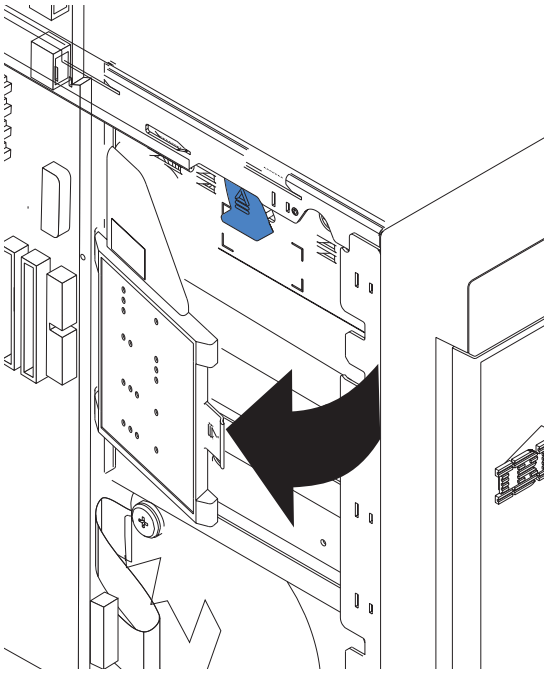
Complete the following steps to remove the diagnostics panel card.

Note:

- Read “Installation guidelines” on page 45.
- Read the safety notices at “Safety information” on page 169.

- Read “Handling electrostatic discharge-sensitive devices” on page 172.

1. Turn off the server.
2. Disconnect all external cables and power cords from the back of the server.
3. Remove the server cover (see “Removing the left-side cover” on page 55).
4. Disconnect and remove adapters and spacers (see “Working with adapters” on page 60).
5. Remove the two central fans (see “Replacing a hot-swap fan” on page 95).
6. Remove the plastic baffle.
7. Disconnect the diagnostics panel card cable from the system board (J23).



8. Grasp the tab on the diagnostics panel card and gently pull up and to the right until the card assembly releases.
9. To replace the diagnostics panel card, line up the two notches on the left and snap the assembly into place; then, connect the cable to the system board.

Power reset card

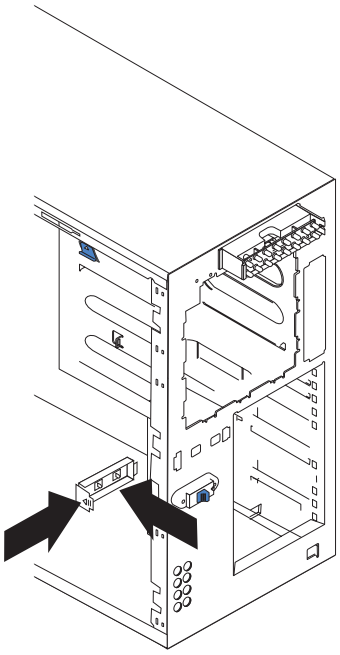
Complete the following steps to remove the power reset card.

Note:

- Read “Installation guidelines” on page 45.
- Read the safety notices at “Safety information” on page 169.
- Read “Handling electrostatic discharge-sensitive devices” on page 172.

1. Turn off the server.
2. Disconnect all external cables and power cords from the back of the server.
3. Remove the bezel (see “Removing the bezel” on page 56).
4. Remove the server cover (see “Removing the left-side cover” on page 55).
5. Disconnect and remove adapters and spacers (see “Working with adapters” on page 60).
6. Remove the two central fans (see “Replacing a hot-swap fan” on page 95).

7. Remove the plastic baffle.
8. Disconnect the power reset card cable from the system board (J47).



9. Press the tab on the front of the power reset card and lift it out from inside the chassis.
10. To replace the power reset card, reverse the previous steps, threading the cable carefully.

Chapter 6. Symptom-to-FRU index

This index supports xSeries 235 servers.

Notes:

1. Check the configuration before you replace a FRU. Configuration problems can cause false errors and symptoms.
2. For IBM devices not supported by this index, refer to the manual for that device.
3. Always start with "General checkout" on page 29.

The symptom-to-FRU index lists symptoms, errors, and the possible causes. The most likely cause is listed first. Use this symptom-to-FRU index to help you decide which FRUs to have available when servicing the computer.

The left-hand column of the tables in this index lists error codes or messages, and the right-hand column lists one or more suggested actions or FRUs to replace.

Note: Some tables have more than two columns; in those instances, more than one column on the left is required to describe the error symptom.

Take the action (or replace the FRU) suggested first in the list of the right-hand column, then try the server again to see if the problem has been corrected before taking further action.

Note: Try reseating a suspected component or reconnecting a cable before replacing the component.

The POST BIOS code displays POST error codes and messages on the screen.

Beep symptoms

Beep symptoms are short tones or a series of short tones separated by pauses (intervals without sound). See the examples in the following table.

Beeps	Description
1-2-3	• One beep • A pause (or break) • Two beeps • A pause (or break) • Three beeps
4	Four continuous beeps

One beep after successfully completing POST indicates the system is functioning properly.

Note: See "System" on page 162 to determine which components should be replaced by a field service technician.	
Beep/symptom	**FRU/action**
1-1-2 (Microprocessor register test failed)	1. **Optional microprocessor (if installed)** 2. Microprocessor 3. System board

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Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Beep/symptom	**FRU/action**
1-1-3 (CMOS write/read test failed)	1. **Battery** 2. System board
1-1-4 (BIOS EEPROM checksum failed)	1. **Recover BIOS** 2. System board
1-2-1 (Programmable Interval Timer failed)	• **System board**
1-2-2 (DMA initialization failed)	• **System board**
1-2-3 (DMA page register write/read failed)	• **System board**
1-2-4 (RAM refresh verification failed)	1. **DIMM** 2. System board
1-3-1 (first 64K RAM test failed)	• **DIMM**
2-1-1 (Secondary DMA register failed)	• **System board**
2-1-2 (Primary DMA register failed)	• **System board**
2-1-3 (Primary interrupt mask register failed)	• **System board**
2-1-4 (Secondary interrupt mask register failed)	• **System board**
2-2-1 (Interrupt vector loading failed)	• **System board**
2-2-2 (Keyboard controller failed)	1. **System board** 2. Keyboard
2-2-3 (CMOS power failure and checksum checks failed)	1. **Battery** 2. System board
2-2-4 (CMOS configuration information validation failed)	1. **Battery** 2. System board
2-3-1 (Screen initialization failed)	• **System board**
2-3-2 (Screen memory failed)	• **System board**
2-3-3 (Screen retrace failed)	• **System board**
2-3-4 (Search for video ROM failed)	• **System board**
2-4-1 (Video failed; screen believed operable)	• **System board**

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Beep/symptom	**FRU/action**
3-1-1 (Timer tick interrupt failed)	• **System board**
3-1-2 (Interval timer channel 2 failed)	• **System board**
3-1-3 (RAM test failed above address OFFFFH))	1. **DIMM** 2. System board
3-1-4 (Time-Of-Day clock failed)	1. **Battery** 2. System board
3-2-1 (Serial port failed)	• **System board**
3-2-2 (Parallel port failed)	• **System board**
3-2-3 (Math coprocessor test failed)	1. **Microprocessor** 2. System board
3-2-4 (Failure comparing CMOS memory size against actual)	1. **DIMM** 2. Battery
3-3-1 (Memory size mismatch occurred.)	1. **DIMM** 2. Battery
3-3-2 (Critical SMBUS error occurred)	1. **Disconnect the server power cord from outlet, wait 30 seconds and retry.** 2. System board. 3. DIMMs. 4. DASD backplane. 5. Power supply. 6. Power cage assembly, if installed. 7. 12C Cable.
3-3-3 (No operational memory in system)	1. **Install or reseat the memory modules, and then do a 3 boot reset.** (For more information on a 3 boot reset, see “Using the Configuration/Setup Utility program” on page 15.) 2. DIMMs. 3. Memory board. 4. System board.
4-4-4 (Optional system management adapter not installed in slot 1 or not functioning correctly)	1. **Verify that the adapter is installed in slot 1.** 2. Adapter. 3. System board.
Two short beeps (Information only, the configuration has changed)	1. **Run Diagnostics.** 2. Run the Configuration/Setup Utility program.
Three short beeps	1. **DIMM** 2. System board

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Beep/symptom	**FRU/action**
One continuous beep	1. **Microprocessor** 2. Optional microprocessor (if installed) 3. System board
Repeating short beeps	1. **Keyboard** 2. System board
One long and one short beep	1. **Video adapter (if installed)** 2. System board
One long and two short beeps	1. **Video adapter (if installed)** 2. System board
One long and three short beeps	1. **Monitor** 2. Video adapter, if installed 3. System board
Two long and two short beeps	• **Video adapter**

No-beep symptoms

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
No-beep symptom	**FRU/action**
No beep and the system operates correctly.	1. **Check speaker cables.** 2. Speaker. 3. System board.
No beeps occur after successfully completing POST (the power-on status is disabled)	1. **Run the Configuration/Setup Utility program, and set the Start Options Power-On Status to enable.** 2. Check the speaker connection. 3. System board.
No ac power (power supply ac LED is off)	1. **Check the power cord.** 2. Power supply. (If two are installed, swap them to determine if one is defective.) 3. Power cage assembly. 4. Hot-swap power ac inlet box.
No beep and no video	• **See “Undetermined problems” on page 157.**
System will not start (power supply ac LED is on)	• **See “Power-supply LED errors” on page 146.**

Diagnostic panel system error LED

The system-error LED is lit when an error is detected. If the system-error LED is lit, remove the cover and check the diagnostic panel LEDs. The following table is a complete list of diagnostics panel LEDs followed by the FRU or action for correcting the problem. The information in the table is valid only when the system-error LED is lit.

Notes:

1. If a diagnostics panel LED is lit and the information LED panel system-error LED is off, there is probably an LED problem. Run LED diagnostics.
2. To locate the LEDs on the system board, see “System-board LED locations” on page 53.
3. Check the System Error Log for additional information before replacing a FRU.
4. The DIMM error LEDs, microprocessor error LEDs, and VRM error LEDs turn off when the system is turned off.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Diagnostics panel LED	**FRU/action**
All LEDs off (Check System Error Log for error condition, then clear System Error Log when the problem is found.)	1. **System Error Log is 75% full; clear the log.** 2. PFA alert; check log for failure; clear PFA alert; remove ac power for at least 20 seconds, reconnect, then turn on the system. 3. Run light path diagnostics.
MEMORY LED on (The LED next to the failing DIMM is on.)	1. **Failing DIMM** 2. System board
CPU LED on (The LED next to the failing CPU is on.)	1. **Microprocessor 1 or 2** 2. System board
PCI BUS LED on	1. **Remove all PCI adapters from slots on affected bus (see “LEDs for Active PCI slots” on page 36 for bus information, see “Adapter considerations” on page 60).** 2. System board.
VRM LED on (The LED next to the failing VRM is on.)	1. **Voltage regulator module indicated by the lit VRM LED.** 2. Microprocessor indicated by the microprocessor LED.
DASD LED on (The LED located next to the drive bay that the failing drive is installed in is lit. Check the amber drive LED for the failing hard drive.)	1. **Be sure the fans are operating correctly and the airflow is good.** 2. If installed, reseat I2C cable between DASD backplane and DASD I2C on the system board (J10). 3. Failing drive. SCSI channel A has failed. (This is the SCSI channel for the hot-swap hard disk drives). 4. SCSI backplane.
SERVICE PROCESSOR BUS LED	1. **Unplug the server for 30 seconds, and then retry.** 2. Reflash or update firmware for ISMP, BIOS. 3. System board.
POWER SUPPLY 1 LED on	1. **Check the dc good LED on power supply 1. If it is off, replace power supply 1.** 2. Power cage assembly, if installed.
POWER SUPPLY 2 LED on	1. **Check the dc good LED on power supply 2. If it is off, replace power supply 2.** 2. Power cage assembly, if installed.
NONREDUNDANT LED on	1. **Check the PS1 and PS2 LEDs and replace any indicated power supply.** 2. Install an additional power supply or remove optional devices from the server.
NMI LED on	1. **Restart the server.** 2. Check the System Error Log.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Diagnostics panel LED	**FRU/action**
TEMPERATURE LED on	1. **Ambient temperature must be within normal operating specifications. See “Features and specifications” on page 3.** 2. Ensure fans are operating correctly. 3. Examine System Error Log. a. System over recommended temperature • Information LED panel b. DASD over recommended temperature (DASD LED also on) 1) Overheating hard drive 2) DASD backplane c. System over recommended temperature for CPU *x* (where *x* is 1 or 2) (CPU LED is also on) 1) CPU *x* 2) System board 4. If the CPU LED on the diagnostics panel is also lit, one of the microprocessors has caused the error.
FAN LED on	1. **Check individual fan LEDs.** 2. Replace respective fan. 3. Fan cable. 4. System board. 5. Power cage assembly, if installed.

Diagnostic error codes

Note: In the following error codes, if *XXX* is *000*, *195*, or *197*, *do not* replace a FRU. The description for these error codes are:

000 The test passed.

195 The Esc key was pressed to stop the test.

197 Warning; a hardware failure might not have occurred.

For all error codes, replace the FRU or take the action indicated.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Error code/symptom	**FRU/action**
001-XXX-000 (Failed core tests)	• **System board**
001-XXX-001 (Failed core tests)	• **System board**
001-250-000 (Failed system board ECC)	• **System board**
001-250-001 (Failed system board ECC)	• **System board**
005-XXX-000 (Failed video test)	• **System board**
011-XXX-000 (Failed COM1 serial port test)	• **System board**

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Error code/symptom	**FRU/action**
011-XXX-001 (Failed COM2 serial port test)	• **System board**
014-XXX-000 (Failed parallel port test)	• **System board**
015-XXX-001 (USB interface not found, board damaged)	1. **System board**
015-XXX-015 (Failed USB external loopback test)	1. **Make sure the parallel port is not disabled.** 2. Run the USB external loopback test again. 3. System board.
015-XXX-198 (USB device connected during USB test)	1. **Remove USB devices from USB1 and USB2.** 2. Run the USB external loopback test again. 3. System board.
020-XXX-000 (Failed PCI interface test)	• **System board**
020-XXX-001 (Failed hot-swap slot 1 PCI latch test)	1. **PCI hot-swap latch assembly** 2. System board
020-XXX-002 (Failed Hot-swap slot 2 PCI latch test)	1. **PCI hot-swap latch assembly** 2. System board
020-XXX-003 (Failed hot-swap slot 3 PCI latch test)	1. **PCI hot-swap latch assembly** 2. System board
020-XXX-004 (Failed hot-swap slot 4 PCI latch test)	1. **PCI hot-swap latch assembly** 2. System board
030-XXX-000 (Failed internal SCSI interface test)	• **System board**
035-XXX-099	1. **No adapters were found.** 2. If adapter is installed re-check connection.
035-XXX-S99 (Failed RAID test on PCI slot S. S = number of failing PCI slot. Check System Error Log before replacing a FRU.)	1. **Adapter** 2. SCSI backplane 3. Cable
035-XXX-SNN (Check System Error Log before replacing a FRU. *s* = number of failing PCI slot, *nn* = SCSI ID of failing fixed disk.)	• **Hard disk drive with SCSI ID *nn*on RAID adapter in PCI slot *s*.**
035-253-S99 (RAID adapter initialization failure)	1. **ServeRAID adapter in slot *s* is not configured properly.** Obtain the basic and extended configuration status and see the *ServeRAID Hardware Maintenance Manual* for more information. 2. Cable. 3. SCSI backplane. 4. Adapter.
075-XXX-000 (Failed power supply test)	• **Power supply**
089-XXX-001 (Failed microprocessor test)	1. **VRM 1 for microprocessor 1** 2. Microprocessor 1

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Error code/symptom	**FRU/action**
089-XXX-002 (Failed optional microprocessor test)	1. **VRM 2** for optional microprocessor 2 2. Optional microprocessor 2
166-198-000 System Management: Aborted (Unable to communicate with ASM. It may be busy. Run the test again.)	1. **Run the diagnostic test again.** 2. Correct other error conditions and retry. These include other failed system management tests and items logged in the System Error Log of the optional Remote Supervisor Adapter. 3. Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and retry. 4. Remote Supervisor Adapter, if installed. 5. System board.
166-201-001 System Management: Failed (I2C bus error(s) See SERVPROC and DIAGS entries in event log.)	1. **If installed, reseat the I2C cable between the Remote Supervisor Adapter (in PCI slot 1/J32) and the system board (J27).** 2. Reseat memory DIMMs. 3. Memory DIMMs. 4. System board.
166-201-002 System Management: Failed (I2C bus error(s) See SERVPROC and DIAGS entries in event log.)	1. **Reseat I2C cable between the operator information panel and the system board (J24).** 2. Reseat I2C cable between the diagnostics panel and the system board (J23). 3. Operator information panel. 4. Diagnostics panel. 5. System board.
166-201-003 System Management: Failed (I2C bus error(s) See SERVPROC and DIAGS entries in event log.)	1. **Reseat cables between the system board and the power supply or power cage assembly, if installed.** 2. Power cage assembly, if installed. 3. System board.
166-201-004 System Management: Failed (I2C bus error(s) See SERVPROC and DIAGS entries in event log.)	1. **DASD backplane** 2. System board
166-201-005 System Management: Failed (I2C bus error(s) See SERVPROC and DIAGS entries in event log.)	1. **Reseat Memory DIMMs.** 2. Reseat microprocessors. 3. Memory DIMMs. 4. Microprocessors. 5. System board.
166-250-000 System Management: Failed (I2C cable is disconnected. Reconnect I2C cable between Remote Supervisor Adapter and system board.)	1. **Reseat I2C cable between the Advanced System Management Adapter (in PCI slot 1/J32) and the system board (J27).** 2. I2C cables. 3. Advanced System Management adapter. 4. System board.
166-260-000 System Management: Failed (Restart ASM Error. After restarting, ASM communication was lost. Unplug and cold boot to reset ASM.)	1. **Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and retry.** 2. Reseat the Remote Supervisor Adapter (in PCI slots 1/J32). 3. Remote Supervisor Adapter.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Error code/symptom	**FRU/action**
166-342-000 System Management: Failed (ASM adapter BIST indicate failed tests.)	1. **Ensure the latest firmware levels for Remote Supervisor Adapter and BIOS.** 2. Disconnect all server and option power cords from server, wait 30 seconds, reconnect, and retry. 3. Remote Supervisor Adapter.
166-400-000 System Management: Failed (ISMP self test result failed tests: *x* where *x* = Flash, RAM, or ROM.)	1. **Reflash or update firmware for ISMP.** 2. System board.
180-XXX-000 (Diagnostics LED failure)	• **Run diagnostics panel LED test for the failing LED.**
180-XXX-001 (Failed front LED panel test)	1. **Operator information panel** 2. System board
180-XXX-002 (Failed diagnostics LED panel test)	1. **Diagnostics panel** 2. System board
180-361-003 (Failed fan LED test)	1. **Fan(s)** 2. System board
180-XXX-003 (Failed system board LED test)	• **System board**
180-XXX-005 (Failed SCSI backplane LED test)	1. **SCSI backplane** 2. SCSI backplane cable 3. System board
201-XXX-0NN (Failed memory test.)	1. **DIMM Location slots 1-6 where *nn* = DIMM location.** **Note:** *nn* 1=DIMM 1; 2=DIMM 2; 3=DIMM 3; 4=DIMM 4; 5=DIMM 5; 6=DIMM 6. 2. System board
201-XXX-999 (Multiple DIMM failure, see error text)	1. **See error text for failing DIMMs.** 2. System board.
202-XXX-001 (Failed system cache test)	1. **VRM 1** 2. Microprocessor 1
202-XXX-002 (Failed system cache test)	1. **VRM 2** 2. Microprocessor 2
206-XXX-000 (Failed diskette drive test)	1. **Cable** 2. Diskette drive 3. System board
215-XXX-000 (Failed IDE CD-ROM drive test)	1. **Re-run test with a different CD-ROM.** 2. CD-ROM drive cables. 3. CD-ROM drive. 4. System board.
217-198-XXX (Could not establish drive parameters)	1. **Check cable and termination.** 2. SCSI backplane. 3. Hard disk.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Error code/symptom	**FRU/action**
217-XXX-000 (Failed BIOS hard disk test) **Note:** If RAID is configured, the hard disk number refers to the RAID logical array.	• **Hard disk 1**
217-XXX-001 (Failed BIOS hard disk test) **Note:** If RAID is configured, the hard disk number refers to the RAID logical array.	• **Hard disk 2**
217-XXX-002 (Failed BIOS hard disk test) **Note:** If RAID is configured, the hard disk number refers to the RAID logical array.	• **Hard disk 3**
217-XXX-003 (Failed BIOS hard disk test) **Note:** If RAID is configured, the hard disk number refers to the RAID logical array.	• **Hard disk 4**
217-XXX-004 (Failed BIOS hard disk test) **Note:** If RAID is configured, the hard disk number refers to the RAID logical array.	• **Hard disk 5**
217-XXX-005 (Failed BIOS hard disk test) **Note:** If RAID is configured, the hard disk number refers to the RAID logical array	• **Hard disk 6**
264-XXX-0NN (Failed tape drive test)	1. **Tape cartridge, if user executed the Read/Write Tape Drive test (failure code of XXX = 256)** 2. SCSI or power cable connected to tape drive with SCSI ID *nn* 3. Tape drive with SCSI ID *nn* (refer to the Help and Service Information appendix of the tape drive’s User Guide) 4. System board or SCSI controller (run SCSI controller diagnostic to determine if the SCSI bus is functioning properly.)
264-XXX-999 (Errors on multiple tape drives, see error text for more info)	• **See error messages/text in the PC Doctor error log for detailed information on each individual tape drive error.**
301-XXX-000 (Failed keyboard test)	• **Keyboard**
405-XXX-000 (Failed Ethernet test on controller on the system board)	1. **Verify that Ethernet is not disabled in BIOS.** 2. System board.
405-XXX-00N (Failed Ethernet test on adapter in PCI slot *n*)	1. **Adapter in PCI slot *n*** 2. System board
415-XXX-000 (Failed Modem test)	1. **Cable.** **Note:** Ensure modem is present and attached to server. 2. Modem. 3. System board.

Error symptoms

You can use the error symptom table to find solutions to problems that have definite symptoms.

If you cannot find the problem in the error symptom charts, go to “Starting the diagnostic programs” on page 34 to test the computer.

If you have just added new software or a new option and the computer is not working, complete the following steps before using the error symptom charts:

1. Remove the software or device that you just added.
2. Run the diagnostic tests to determine if the computer is running correctly.
3. Reinstall the new software or new device.

In the following table, if the entry in the FRU/action column is a suggested action, perform that action; if it is the name of a component, reseat the component and replace it if necessary. The most likely cause of the symptom is listed first.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
CD-ROM drive problems	
Symptom	**FRU/action**
CD-ROM drive is not recognized.	1. **Verify that:** • The IDE channel to which the CD-ROM drive is attached (primary or secondary) is enabled in the Configuration/Setup Utility program. • All cables and jumpers are installed correctly. • The correct device driver is installed for the CD-ROM drive. 2. Run CD-ROM drive diagnostics. 3. CD-ROM drive.
CD is not working properly.	1. **Clean the CD.** 2. Run CD-ROM drive diagnostics. 3. CD-ROM drive.
CD-ROM drive tray is not working. (The computer must be turned on.)	1. **Insert the end of a straightened paper clip into the manual tray-release opening.** 2. Run CD-ROM drive diagnostics. 3. CD-ROM drive.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Diskette drive problems	
Symptom	**FRU/action**
Diskette drive activity LED stays on, or the system bypasses the diskette drive.	1. **If there is a diskette in the drive, verify that:** • The diskette drive is enabled in the Configuration/Setup utility program. • The diskette is good and not damaged. (Try another diskette if you have one.) • The diskette is inserted correctly in the drive. • The diskette contains the necessary files to start the computer. • The software program is working properly. • The cable is installed correctly (in the proper orientation). 2. To prevent diskette drive read/write errors, be sure the distance between monitors and diskette drives is at least 76 mm (3 in.). 3. Run diskette drive diagnostics. 4. Cable. 5. Diskette drive. 6. System board.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Expansion enclosure problems	
Symptom	**FRU/action**
The SCSI expansion enclosure used to work but does not work now.	1. **Verify that:** • The cables for all external SCSI options are connected correctly. • The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. • Any external SCSI option is turned on. You must turn on an external SCSI option before turning on the computer. 2. For more information, see your SCSI expansion enclosure documentation.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Hard disk drive problems	
Symptom	**FRU/action**
Not all drives are recognized by the hard disk drive diagnostic test (Fixed Disk test).	1. **Remove the first drive not recognized and try the hard disk drive diagnostic test again.** 2. If the remaining drives are recognized, replace the drive you removed with a new one.
System stops responding during hard disk drive diagnostic test.	1. **Remove the hard disk drive being tested when the computer stopped responding and try the diagnostic test again.** 2. If the hard disk drive diagnostic test runs successfully, replace the drive you removed with a new one.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
General problems	
Symptom	**FRU/action**
Problems such as broken cover locks or indicator LEDs not working	• **Broken CRU/FRU**

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Intermittent problems	
Symptom	**FRU/action**
A problem occurs only occasionally and is difficult to detect.	1. **Verify that:** • All cables and cords are connected securely to the rear of the computer and attached options. • When the computer is turned on, air is flowing from the rear of the computer at the fan grill. If there is no airflow, the fan is not working. This causes the computer to overheat and shut down. • Ensure that the SCSI bus and devices are configured correctly and that the last external device in each SCSI chain is terminated correctly. 2. Check t he system error log.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Keyboard, mouse, or pointing-device problems	
Symptom	**FRU/action**
All or some keys on the keyboard do not work.	1. **Verify that:** • The keyboard cable is securely connected to the system, and the keyboard and mouse cables are not reversed. • Both the computer and the monitor are turned on. 2. Keyboard. 3. System board.
The mouse or pointing device does not work.	1. **Verify that:** • The mouse or pointing-device cable is securely connected, and that the keyboard and mouse cables are not reversed. • The mouse device drivers are installed correctly. • Both the computer and the monitor are turned on. 2. Mouse or pointing device. 3. System board.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Memory problems	
Symptom	**FRU/action**
The amount of system memory displayed is less than the amount of physical memory installed.	1. **Verify that:** • The memory modules are seated properly. • You have installed the correct type of memory. • If you changed the memory, you updated the memory configuration with the Configuration/Setup Utility program. • All banks of memory on the DIMMs are enabled. The computer might have automatically disabled a DIMM bank when it detected a problem or a DIMM bank could have been manually disabled. 2. Check POST error log for error message 289: • If the DIMM was disabled by a system-management interrupt (SMI), replace the DIMM. • If the DIMM was disabled by the user or by POST: a. Start the Configuration/Setup Utility program. b. Enable the DIMM. c. Save the configuration and restart the computer. 3. DIMM. 4. System board.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Microprocessor problems	
Symptom	**FRU/action**
The computer emits a continuous tone during POST. (The startup (boot) microprocessor is not working properly.)	1. **Verify that the startup microprocessor is seated properly.** 2. Startup microprocessor.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Monitor problems	
Symptom	**FRU/action**
Testing the monitor.	• **See the information that comes with the monitor** for adjusting and testing instructions. (Some IBM monitors have their own self-tests.)

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Monitor problems	
Symptom	**FRU/action**
The screen is blank.	1. **Verify that:** • The computer power cord is plugged into the computer and a working electrical outlet. • The monitor cables are connected properly. • The monitor is turned on and the Brightness and Contrast controls are adjusted correctly. • If the computers are C2T chained together, verify that: – The C2T chain cables are securely connected to the computers. – The C2T breakout cable is connected properly. – A computer that is turned on is selected. **Important:** In some memory configurations, the 3-3-3 beep code might sound during POST followed by a blank display screen. If this occurs and the **Boot Fail Count** feature in the Start Options of the Configuration/Setup Utility program is set to **Enabled** (its default setting), you must restart the computer three times to force the system BIOS code to reset the CMOS values to the default configuration (memory connector or bank of connectors enabled). 2. If you have verified these items and the screen remains blank, replace: a. Monitor b. Video adapter, if installed c. System board
Only the cursor appears.	• See “Undetermined problems” on page 157.
The monitor works when you turn on the computer but goes blank when you start some application programs.	1. **Verify that:** • The application program is not setting a display mode higher than the capability of the monitor. • The primary monitor cable is connected to the C2T device breakout cable. • You installed the necessary device drivers for the applications. 2. If you have verified these items and the screen remains blank, replace the monitor. 3. Video adapter. 4. System board.
The screen is wavy, unreadable, rolling, distorted, or has screen jitter.	1. **If the monitor self-tests show the monitor is working properly, consider the location of the monitor.** Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. (Moving a color monitor while it is turned on might cause screen discoloration.) Then move the device and the monitor at least 305 mm (12 in.) apart. Turn on the monitor. **Notes:** a. To prevent diskette drive read/write errors, be sure the distance between monitors and diskette drives is at least 76 mm (3 in.). b. Non-IBM monitor cables might cause unpredictable problems. c. An enhanced monitor cable with additional shielding is available for the 9521 and 9527 monitors. For information about the enhanced monitor cable, contact your IBM reseller or IBM marketing representative. 2. Monitor. 3. Video adapter, if installed. 4. System board.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Monitor problems	
Symptom	**FRU/action**
Wrong characters appear on the screen.	1. If the wrong language is displayed, update the BIOS code with the correct language. 2. Monitor. 3. Video adapter, if installed. 4. System board.
No video.	1. **Make sure the correct machine is selected, if applicable.** 2. Make sure all cables are locked down.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Option problems	
Symptom	**FRU/action**
An IBM option that was just installed does not work.	1. **Verify that:** • The option is designed for the computer (see the ServerProven list on the World Wide Web at http://www.ibm.com/pc/compat/). • You followed the installation instructions that came with the option. • The option is installed correctly. • You have not loosened any other installed options or cables. • You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or an option is changed, you must update the configuration. 2. Option you just installed.
An IBM option that used to work does not work now.	1. **Verify that all of the option hardware and cable connections are secure.** 2. If the option comes with its own test instructions, use those instructions to test the option. 3. If the failing option is a SCSI option, verify that: • The cables for all external SCSI options are connected correctly. • The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. • Any external SCSI option is turned on. You must turn on an external SCSI option before turning on the computer. 4. Failing option.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Power problems	
Symptom	**FRU/action**
Power switch does not work and reset button, if supported, does work.	1. **Reseat connector.** 2. Power switch card. 3. System board.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Power problems	
Symptom	**FRU/action**
The computer does not turn on.	1. **Verify that:** • The power cables are properly connected to the computer. • The electrical outlet functions properly. • The type of memory installed is correct. • If you just installed an option, remove it, and restart the computer. If the computer now turns on, you might have installed more options than the power supply supports. 2. Override front panel power button: a. Disconnect computer power cords. b. Reconnect power cords. If computer turns on: a. Operator information panel If computer does not turn on: • System board 3. See “Undetermined problems” on page 157.
The computer does not turn off.	1. **Verify whether you are using an ACPI or non-ACPI operating system.** If you are using a non-ACPI operating system: a. Press Ctrl+Alt+Delete. b. Turn off the system by holding the power-control button for 4 seconds. c. If computer fails during BIOS POST and power-control button does not work, remove the AC power cord. 2. If the problem remains or if you are using an ACPI-aware operating system, suspect the system board.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Serial port problems	
Symptom	**FRU/action**
The number of serial ports identified by the operating system is less than the number of serial ports installed.	1. **Verify that:** • Each port is assigned a unique address by the Configuration/Setup Utility program and none of the serial ports is disabled. • The serial-port adapter, if you installed one, is seated properly. 2. Failing serial port adapter.
A serial device does not work.	1. **Verify that:** • The device is compatible with the computer. • The serial port is enabled and is assigned a unique address. • The device is connected to the correct port (see “Input/output connectors” on page 108). 2. Failing serial device. 3. Serial adapter, if installed. 4. System board.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Software problem	
Symptom	**FRU/action**
Suspected software problem.	1. **To determine if problems are caused by the software, verify that:** • The computer has the minimum memory needed to use the software. For memory requirements, see the information that comes with the software. **Note:** If you have just installed an adapter or memory, you might have a memory address conflict. • The software is designed to operate on the computer. • Other software works on the computer. • The software that you are using works on another system. If you received any error messages when using the software program, see the information that comes with the software for a description of the messages and suggested solutions to the problem. 2. If you have verified these items and the problem remains, contact your place of purchase.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Universal Serial Bus (USB) port problems	
Symptom	**FRU/action**
A USB device does not work.	• **Verify that:** – You are not trying to use a USB device during POST if you have a standard (non-USB) keyboard attached to the keyboard port. **Note:** If a standard (non-USB) keyboard is attached to the keyboard port, the USB is disabled and no USB device will work during POST. – The correct USB device driver is installed. – The operating system supports USB devices.

Power-supply LED errors

Use the information in this section to solve power-supply problems.

Note: The minimum configuration required for the dc good light to be lit is:
- Power supply
- Power cage assembly, if installed.
- System board (set switch 7 of SW1 to bypass the power switch; see “System-board switches and jumpers” on page 51.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.			
AC good LED	**DC good LED**	**Description**	**FRU/action**
Off	Off	No power to system or ac problem.	1. **Check ac power to the system.** 2. Power supply.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.			
AC good LED	**DC good LED**	**Description**	**FRU/action**
On	Off	Standby mode or dc problem.	1. **Check system board cable connectors J4 and J10.** Move switch 7 of SW 1 to bypass power control. If the dc good LED is lit, press Ctrl+Alt+Delete. Watch the screen for any POST errors. Check the System Error Log for any listed problems. If the system starts with no errors: a. Power switch assembly b. System board 2. Remove the adapters and disconnect the cables and power connectors to all internal and external devices. Turn on the system. If the dc good LED is lit, replace the adapters and devices one at a time until you isolate the problem. 3. Power supply. 4. Power cage assembly, if installed. 5. System board.
On	On	Power is working properly.	N/A

POST error codes

In the following error codes, *X* can be any number or letter.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Error code/symptom	**FRU/action**
062 (Three consecutive startup failures using the default configuration.)	1. **Run the Configuration/Setup Utility program.** 2. Battery. 3. System board. 4. Microprocessor.
101, 102 (System and processor error)	• **System board**
106 (System and processor error)	• **System board**
111 (Channel check error)	1. **Memory DIMM** 2. System board
114 (Adapter read-only memory error)	1. **Failing adapter.** 2. Run diagnostics.
129 (Internal cache error)	1. **Microprocessor** 2. Optional microprocessor (if installed)
151 (Real time clock error)	1. **Run diagnostics.** 2. Battery. 3. System board.
161 (Real time clock battery error)	1. **Run the Configuration/Setup Utility program.** 2. Battery. 3. System board.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Error code/symptom	**FRU/action**
162 (Device configuration error) **Note:** Be sure to load the default settings and any additional desired settings; then, *save the configuration*.	1. **Run the Configuration/Setup Utility program.** 2. Battery. 3. Failing device. 4. System board.
163 (Real-time clock error)	1. **Run the Configuration/Setup Utility program.** 2. Battery. 3. System board.
164 (Memory configuration changed.)	1. **Run the Configuration/Setup Utility program.** 2. DIMM. 3. System board.
175 (Hardware error)	• **System board**
176 (Computer cover or cable cover was removed without a key being used)	1. **Run the Configuration/Setup Utility program.** 2. System board.
177, 178 (Security hardware error)	1. **Run the Configuration/Setup Utility program.** 2. System board.
184 (Power-on password damaged)	1. **Run the Configuration/Setup Utility program.** 2. System board.
185 (Drive startup sequence information corrupted)	1. **Run the Configuration/Setup Utility program.** 2. System board.
186 (Security hardware control logic failed)	1. **Run the Configuration/Setup Utility program.** 2. System board.
187 (VPD serial number not set.)	1. **Set serial number in the Configuration/Setup Utility program.** 2. System board.
188 (Bad EEPROM CRC #2)	1. **Run the Configuration/Setup Utility program.** 2. System board.
189 (An attempt was made to access the server with invalid passwords)	• **Run the Configuration/Setup Utility program, and type the administrator password.**
196, 198, 199 (Microprocessor mismatch)	1. **Verify microprocessors are of same type and speed.** 2. Microprocessor.
201 (Memory test error.) If the server does not have the latest level of BIOS installed, update the BIOS to the latest level and run the diagnostic program again.	1. **DIMM** 2. System board
229 (Cache error)	1. **Microprocessor** 2. Optional microprocessor (if installed)
262 (DRAM parity configuration error)	1. **Run the Configuration/Setup Utility program.** 2. Battery. 3. System board.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Error code/symptom	**FRU/action**
289 (DIMM disabled by POST or user)	1. **Run the Configuration/Setup Utility program, if the DIMM was disabled by the user.** 2. Disabled DIMM, if not disabled by user.
301 (Keyboard or keyboard controller error)	1. **Keyboard** 2. System board
303 (Keyboard controller error)	• **System board**
602 (Invalid diskette boot record)	1. **Diskette** 2. Diskette drive 3. Cable 4. System board
604 (Diskette drive error)	1. **Run the Configuration/Setup Utility program and diagnostics.** 2. Diskette drive. 3. Drive cable. 4. System board.
605 (Unlock failure)	1. **Diskette drive** 2. Drive cable 3. System board
662 (Diskette drive configuration error)	1. **Run the Configuration/Setup Utility program and diagnostics.** 2. Diskette drive. 3. Drive cable. 4. System board.
762 (Coprocessor configuration error)	1. **Run the Configuration/Setup Utility program.** 2. Battery. 3. Microprocessor.
962 (Parallel port error)	1. **Disconnect the external cable on the parallel port.** 2. Run the Configuration/Setup Utility program. 3. System board.
11XX (System board serial port 1 or 2 error)	1. **Disconnect the external cable on the serial port.** 2. Run the Configuration/Setup Utility program. 3. System board.
1301 (I^2C cable to front panel not found)	1. **Verify operator information panel cable is connected to J24 on system board.** 2. Cable. 3. Front panel 4. Power switch assembly 5. System board
1302 (I^2C cable from system board to power on and reset switches not found)	1. **Verify power on and reset switch cable is connected to J23 on system board.** 2. Cable. 3. Power switch assembly 4. System board

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Error code/symptom	**FRU/action**
1303 (I^2C cable from system board to power backplane not found)	1. **Cable** 2. Power cage assembly, if installed 3. System board
1304 (I^2C cable to diagnostic LED board not found)	1. **Verify Light Path Diagnostics panel cable is connected to J23 on system board.** 2. Power switch assembly. 3. System board.
1600 (The system management processor is not functioning) Do the following before replacing a FRU: 1. Ensure that a jumper is not installed on J34. 2. Remove the ac power to the server, wait 20 seconds; then, reconnect the ac power. Wait 30 seconds; then, turn on the server.	• **System board**
1601 (The system is able to communicate to the system management processor, but the system management processor failed to respond at the start of POST.) Do the following before replacing a FRU: 1. Remove the ac power to the server, wait 20 seconds; then, reconnect the ac power. Wait 30 seconds; then, turn on the server. 2. Flash update the system management processor.	1. **Remote Supervisor Adapter, if installed** 2. System board
1602 (Cable for optional service processor adapter not installed)	1. **Verify that service processor adapter cable is connected to J27 on system board.** 2. Disconnect all server and option power cords from server, wait 30 seconds, reconnect, and retry.
1762 (Hard disk configuration error)	1. **Hard disk drive.** 2. Hard disk cables. 3. Run the Configuration/Setup Utility program. 4. Hard disk adapter. 5. SCSI backplane. 6. System board.
178X (Fixed disk error)	1. **Hard disk cables.** 2. Run diagnostics. 3. Hard disk adapter. 4. Hard disk drive. 5. System board.
1800 (No more hardware interrupt available for PCI adapter)	1. **Run the Configuration/Setup Utility program.** 2. Failing adapter. 3. System board.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Error code/symptom	**FRU/action**
1962 (Drive does not contain a valid boot sector)	1. **Verify that a startable operating system is installed.** 2. Run diagnostics. 3. Hard disk drive. 4. SCSI backplane. 5. Cable. 6. System board.
2400 (Video controller test failure)	1. **Video adapter (if installed)** 2. System board
2462 (Video memory configuration error)	1. **Video adapter (if installed)** 2. System board
5962 (IDE CD-ROM drive configuration error)	1. **Run the Configuration/Setup Utility program.** 2. CD-ROM drive. 3. CD-ROM power cable. 4. IDE cable. 5. System board. 6. Battery.
8603 (Pointing-device error)	1. **Pointing device** 2. System board
0001200 (Machine check architecture error)	1. **Microprocessor 1** 2. Optional microprocessor 2
00012000 (Microprocessor machine check)	1. **Microprocessor** 2. System board
00019501 (Microprocessor 1 is not functioning - check VRM and microprocessor LEDs)	1. **VRM 1** 2. Microprocessor 1 3. System board
00019502 (Microprocessor 2 is not functioning - check VRM and microprocessor LEDs)	1. **VRM 2** 2. Microprocessor 2
00019701 (Microprocessor 1 failed)	1. **Microprocessor 1** 2. System board
00019702 (Microprocessor 2 failed)	1. **Microprocessor 2** 2. System board
00180100 (A PCI adapter has requested memory resources that are not available.)	1. **Reorder the adapters in the PCI slots. It is important that your startup device is positioned early in the startup-device order so that it is run by POST.** 2. Ensure that the PCI adapter and all other adapters are set correctly in the Configuration/Setup Utility program Utility program. If the memory resource settings are not correct, change the settings. 3. If all memory resources are being used, you might need to remove an adapter to make memory available to the PCI adapter. Disabling the adapter BIOS on the adapter might correct the error. (See the documentation provided with the adapter.)

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Error code/symptom	**FRU/action**
00180200 (No more I/O space available for PCI adapter)	1. **Run the Configuration/Setup Utility program.** 2. Failing adapter. 3. System board.
00180300 (No more memory (above 1MB for PCI adapter))	1. **Run the Configuration/Setup Utility program.** 2. Failing adapter. 3. System board.
00180400 (No more memory (below 1MB for PCI adapter))	1. **Run the Configuration/Setup Utility program.** 2. Move the failing adapter to slot 1. 3. Failing adapter. 4. System board.
00180500 (PCI option ROM checksum error)	1. **Remove failing PCI card.** 2. System board.
00180600 (PCI to PCI bridge error)	1. **Run the Configuration/Setup Utility program.** 2. Move the failing adapter to slot 1. 3. Failing adapter. 4. System board
00180700, 00180800 (General PCI error)	1. **System board** 2. PCI card
00181000 (PCI error)	• **Adapter** • System board
01295085 (ECC checking hardware test error)	1. **System board** 2. Microprocessor
01298001 (System BIOS installed on this server does not support level of processor)	1. **Ensure all microprocessors have the same cache size.** 2. Microprocessor 1.
01298002 (System BIOS installed on this server does not support level of processor)	1. **Ensure all microprocessors have the same cache size.** 2. Microprocessor 2.
01298101 (System BIOS installed on this server does not support level of processor)	1. **Ensure all microprocessors have the same cache size.** 2. Microprocessor 1.
01298102 (System BIOS installed on this server does not support level of processor)	1. **Ensure all microprocessors have the same cache size.** 2. Microprocessor 2.
I9990301 (Hard disk sector error)	1. **Hard disk drive** 2. SCSI backplane 3. Cable 4. System board
I9990305 (Hard disk sector error, no operating system installed)	1. **Install operating system to hard disk.**

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Error code/symptom	**FRU/action**
I9990650 (AC power has been restored)	1. **Check cable.** 2. Check for interruption of power. 3. Power cable.

Service processor error codes

When viewed from POST, service processor error codes will appear in hexadecimal form (generally beginning with A2, A3, A4, A5, A6, A7, AD, AE, or E1). However, when viewed from the System Error Log, the messages will appear as text. To determine a possible error condition for the service processor, see the System Error Log (see “Viewing error logs from the diagnostic programs” on page 32).

SCSI error codes

Note: If a ServeRAID-5i controller is installed and later removed, you must re-enable the on-board SCSI controller in using the Configuration/Setup Utility program (see “Starting the Configuration/Setup Utility program” on page 15).

Error code	FRU/action
All SCSI Errors One or more of the following might be causing the problem: • A failing SCSI device (adapter, drive, controller) • An improper SCSI configuration or SCSI termination jumper setting • Duplicate SCSI IDs in the same SCSI chain • A missing or improperly installed SCSI terminator • A defective SCSI terminator • An improperly installed cable • A defective cable	1. **External SCSI devices must be turned on before you turn on the server.** 2. Make sure that the cables for all external SCSI devices are connected correctly. 3. If you have attached an external SCSI device to the server, make sure the external SCSI termination is set to automatic. 4. Make sure that the last device in each SCSI chain is terminated correctly. 5. Make sure that the SCSI devices are configured correctly.

Temperature error messages

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Message	**Action**
DASD Over Temperature (level-critical; direct access storage device bay *x* was over temperature)	• **Ensure that the system is being properly cooled**; see “System reliability considerations” on page 45.
DASD Over recommended Temperature (sensor *x*) (level-warning; DASD bay *x* had over temperature condition)	• **Ensure that the system is being properly cooled**; see “System reliability considerations” on page 45.

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Message	**Action**
DASD under recommended temperature (sensor *x*) (level-warning; direct access storage device bay *x* had under temperature condition)	• **Ambient temperature must be within normal operating specifications**; see “Features and specifications” on page 3.
DASD Over Temperature (level-critical; sensor for DASD1 reported temperature over recommended range)	• **Ensure system is being properly cooled**; see “System reliability considerations” on page 45.
Power supply *x* Temperature Fault (level-critical; power supply *x* had over temperature condition)	1. **Ensure system is being properly cooled;** see “System reliability considerations” on page 45. 2. Replace power supply *x*
System board is over recommended temperature (level-warning; system board is over recommended temperature)	1. **Ensure system is being properly cooled**; see “System reliability considerations” on page 45. 2. Replace the system board.
System board is under recommended temperature (level-warning; system board is under recommended temperature)	• **Ambient temperature must be within normal operating specifications**; see “Features and specifications” on page 3.
System over temperature for CPU *x* (level-warning; CPU x reporting over temperature condition)	• **Ensure system is being properly cooled;** see“System reliability considerations” on page 45.
System under recommended CPU *x* temperature (level-warning; system reporting under temperature condition for CPU x)	• **Ambient temperature must be within normal operating specifications**; see “Features and specifications” on page 3.

Fan error messages

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Message	**Action**
Fan *x* failure (level-critical; fan *x* had a failure)	1. **Check connections to fan *x*.** 2. Replace fan *x*.
Fan *x* fault (level-critical; fan *x* beyond recommended RPM range)	1. **Check connections to fan *x*.** 2. Replace fan *x*.
Fan *x* outside recommended speed action	1. **Replace fan *x*.**

Power error messages

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Message	**Action**
Power supply *x* current share fault (level-critical; excessive current demand on power supply *x*)	• **Replace power supply *x*.**

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Message	**Action**
Power supply *x* DC good fault (level-critical; power good signal not detected for power supply *x*)	• **Replace power supply *x*.**
Power supply *x* temperature fault	• **Replace power supply *x*.**
Power supply *x* removed	• **No action required - information only**.
Power supply *x* fan fault (level-critical; fan fault in power supply *x*)	• **Replace power supply *x*.**
Power supply *x* 12 V fault (level-critical; overcurrent condition detected)	• **See “Power checkout” on page 40.**
Power supply *x* 3.3 V fault (level-critical; 3.3 V power supply *x* had an error)	• **See “Power checkout” on page 40.**
Power supply *x* 5 V fault (level-critical; 5 V power supply *x* had an error)	• **See “Power checkout” on page 40.**
System running non-redundant power (level-noncritical; system does not have redundant power)	1. **Add another power supply.** 2. Remove options from system. 3. System can continue to operate without redundancy protection if steps1 and 2 are not followed.
System under recommended voltage for *x* (level-warning; indicated voltage supply under nominal value; value for *x* can be +12, -12, or +5)	1. **Check connections to the power subsystem.** 2. Power supply. 3. Power cage assembly, if installed.

System shutdown

Refer to the following tables when experiencing system shutdown related to voltage or temperature problems.

Voltage related system shutdown

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Message	**Action**
System shutoff due to *x* current over max value (level-critical; system drawing too much current on voltage *x* bus)	• **See “Power checkout” on page 40.**
System shutoff due to *x* V over voltage (level-critical; system shutoff due to *x* supply over voltage)	1. **Check the power-supply connectors** 2. Power supply. 3. Power cage assembly, if installed.
System shutoff due to *x* V under voltage (level-critical system shutoff due to *x* supply under voltage)	1. **Check the power-supply connectors.** 2. Power supply. 3. Power cage assembly, if installed.
System shutoff due to VRM x over voltage	• **Replace VRM *x*.**
System shutoff due to excessive (< 240 VA) loading	1. **See “Power checkout” on page 40.** 2. Cycle ac on/off.

Temperature related system shutdown

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Message	**Action**
System shutoff due to board over temperature (level-critical; board is over temperature)	1. **Ensure that the system is being properly cooled**; see “System reliability considerations” on page 45″. 2. Replace board.
System shutoff due to CPU x over temperature (level-critical; CPU *x* is over temperature)	1. **Ensure that the system is being properly cooled**; see “System reliability considerations” on page 45. 2. Replace CPU *x*.
System shutoff due to CPU *x* under temperature (level-critical; CPU *x* is under temperature)	• **Ambient temperature must be within normal operating specifications**; see “Features and specifications” on page 3.
System shutoff due to DASD temperature (sensor *x*) (level-critical; DASD area reported temperature outside recommended operating range)	• **Ensure that the system is being properly cooled**; see “System reliability considerations” on page 45.
System shutoff due to high ambient temperature (level-critical; high ambient temperature)	• **Ambient temperature must be within normal operating specifications**; see “Features and specifications” on page 3.
System shutoff due to system board under temperature (level-critical; system board is under temperature)	• **Ambient temperature must be within normal operating specifications**; see “Features and specifications” on page 3.

DASD checkout

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Message	**Action**
Hard drive *x* removal detected (level-critical; hard drive *x* has been removed)	• **Information only, take action as appropriate.**

Host built-in self test (BIST)

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Message	**Action**
Host fail (level-informational; built-in self-test for the host failed)	1. **Reseat the microprocessor.** 2. Reseat the VRM. 3. Replace the microprocessor CPU.

Bus fault messages

Note: See “System” on page 162 to determine which components should be replaced by a field service technician.	
Bus fault messages	**Message Action**
Failure reading 12C device. Check devices on bus 0.	1. **If installed, reseat the I2C cable between Remote Supervisor Adapter (in PCI slot 1/J32) and system board (J45).** 2. Memory DIMMs. 3. System board.
Failure reading 12C device. Check devices on bus 1.	1. **Reseat the I2C cable between the operator information panel and system board (J24).** 2. Operator information panel. 3. System board.
Failure reading 12C device. Check devices on bus 2.	1. **Reseat the cable between system board and the power supply (power cage assembly, if installed) (J10).** 2. Power cage assembly, if installed. 3. Power supply. 4. System board.
Failure reading 12C device. Check devices on bus 3.	1. **Reseat the cable between the DASD backplane and connector (J10) of system board.** 2. DASD backplane. 3. System board.
Failure reading I2C device. Check device on bus 4.	• **System board**

Undetermined problems

Use the information in this section if the diagnostic tests did not identify the failure, the devices list is incorrect, or the system is inoperative.

Notes:

1. Damaged data in CMOS can cause undetermined problems.
2. Damaged data in BIOS code can cause undetermined problems.

Check the LEDs on all the power supplies. If the LEDs indicate the power supplies are working correctly, complete the following steps:

1. Turn off the server.
2. Be sure the server is cabled correctly.
3. Remove or disconnect the following devices (one at a time) until you find the failure (turn on the server and reconfigure each time):
   Any external devices
   Surge suppressor device (on the server)
   Modem, printer, mouse, or non-IBM devices
   Each adapter
   Drives
   Memory modules (minimum requirement = 256 MB (2 banks of 128 MB DIMMs))

   Note: Minimum operating requirements are:
   a. One power supply
   b. Power cage assembly, if installed.

c. System board
d. One microprocessor and VRM
e. Memory module (with a minimum of two 128 MB DIMMs)

4. Turn on the server. If the problem remains, suspect the following FRUs in the order listed:
   Power supply
   Power cage assembly, if installed
   System board

Notes:

1. If the problem goes away when you remove an adapter from the system and replacing that adapter does not correct the problem, suspect the system board.
2. If you suspect a networking problem and all the system tests pass, suspect a network cabling problem external to the system.

Problem determination tips

Due to the variety of hardware and software combinations that can be encountered, use the following information to assist you in problem determination. If possible, have this information available when requesting assistance from Service Support and Engineering functions.

- Machine type and model
- Microprocessor or hard disk upgrades
- Failure symptom
  - Do diagnostics fail?
  - What, when, where, single, or multiple systems?
  - Is the failure repeatable?
  - Has this configuration ever worked?
  - If it has been working, what changes were made prior to it failing?
  - Is this the original reported failure?
- Diagnostics version
  - Type and version level
- Hardware configuration
  - Print (print screen) configuration currently in use
  - BIOS level
- Operating system software
  - Type and version level

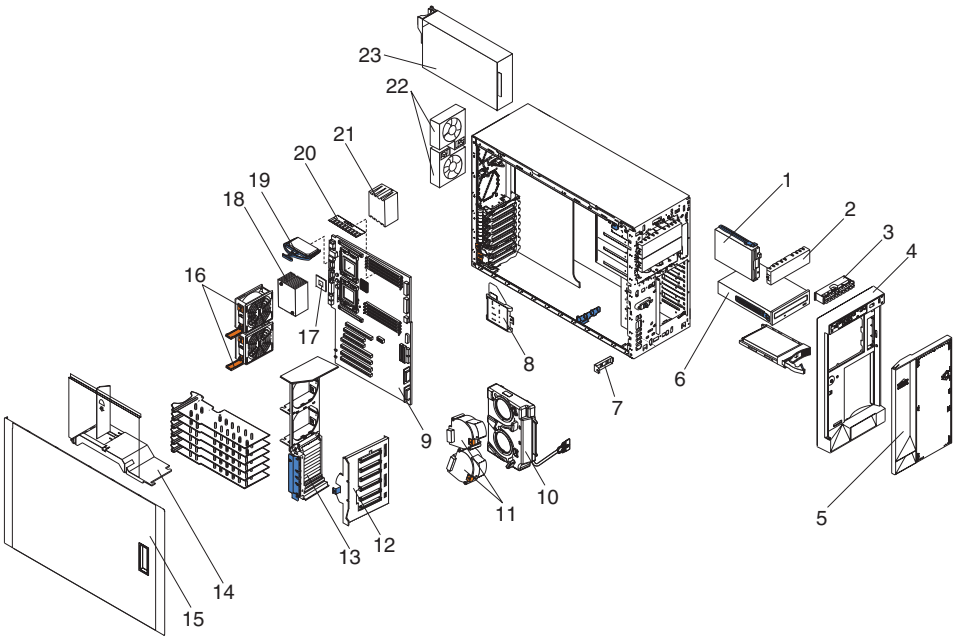
Note: To eliminate confusion, identical systems are considered identical only if they:

1. Are the exact machine type and models
2. Have the same BIOS level
3. Have the same adapters/attachments in the same locations
4. Have the same address jumpers/terminators/cabling
5. Have the same software versions and levels
6. Have the same diagnostics code (version)
7. Have the same configuration options set in the system
8. Have the same setup for the operation system control files

Comparing the configuration and software set-up between ″working″ and ″non-working″ systems will often lead to problem resolution.

Chapter 7. Parts listing for the xSeries 235

This parts listing supports the xSeries 235 (Type 8671).



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System

Note: Field replaceable units (FRUs) should be serviced only by qualified field service technicians. Customer replacement units can be replaced by the customer.

Index	System (xSeries 235, Type 8671, Models 11X, 1AX, 21X, 2AX, 31X, 3AX, 41X, 4AX, 61X, 6AX, 6BX, 71X, 7AX, 7BX)	FRU No.	CRU/FRU
1	Diskette drive (all models)	76H4091	CRU
2	Filler, hard disk drive (all models)	06P6245	CRU
3	Operator information panel (all models)	59P5808	FRU
4	Bezel, front (all models)	59P4167	CRU
5	Door assembly (all models)	24P0615	CRU
6	CD-ROM drive, 48X (primary) (all models)	33P3203	CRU
6	CD-ROM drive, 48X (alternate) (all models)	33P3215	CRU
6	CD-ROM drive, 48X (alternate) (all models)	33P3211	CRU
6	CD-ROM drive, 48X (alternate) (all models)	33P3207	CRU
7	Power reset card (all models)	25P3306	FRU
8	Diagnostics panel card (all models)	21P9728	FRU
9	System board assembly (models 11X 1AX 21X 2AX 31X 3AX 41X 4AX)	02R2384	FRU
9	System board assembly (models 61X 6AX 6BX 71X 7AX 7BX)	71P8037	FRU
10	Front fan housing (all models)	00N6409	FRU
11	Fan assembly (all models)	09N7499	CRU
12	DASD backplane with carrier assembly (all models)	02R1872	FRU
13	Guide, fan/card assembly (models 11X 1AX 21X 2AX 31X 3AX 41X 4AX)	59P4159	CRU
13	Guide, fan/card assembly (models 61X 6AX 6BX 71X 7AX 7BX)	59P4238	CRU
13	Guide, fan/card assembly (models 61X 6AX 6BX 71X 7AX 7BX)	02R9322	CRU
14	Baffle (all models)	59P4160	CRU
15	Cover, I cover (all models)	21P9660	CRU
16	Fan assembly, 92 mm (all models)	09N9474	CRU
17	Microprocessor, 1.8-0K-L3 (models 11X 1AX)	24P3525	FRU
17	Microprocessor, 2.0-0K-L3 (models 21X 2AX)	25P2671	FRU
17	Microprocessor, 2.2-0K-L3 (models 31X 3AX)	32P8582	FRU
17	Microprocessor, 2.4-0K-L3 (models 41X 4AX)	37L3570	FRU
17	Microprocessor, 533/2.67-512 (models 61X 6AX 6BX)	59P4840	FRU
17	Microprocessor, 533/2.8-512 (models 71X 7AX 7BX)	59P4845	FRU
18	Heat sink (all models)	25P6309	CRU
19	VRM, 9.1 (models 61X 6AX 6BX 71X 7AX 7BX)	49P2010	CRU
19	VRM, 9.05 (models 11X 1AX 21X 2AX 31X 3AX 41X 4AX)	49P2129	CRU
20	Memory, 256 MB (models 1AX 2AX 3AX 4AX 61X 6AX 6BX 71X 7AX 7BX)	09N4306	CRU
20	Memory, 128 MB (models 11X 21X 31X 41X)	09N4305	CRU
21	Baffle (all models)	24P1284	CRU
22	Fan, rear, hot-swap (all models)	21P9707	CRU
23	Power supply, 560 W redundant (models 1AX 2AX 3AX 4AX 6AX 6BX 7AX 7BX)	49P2038	CRU
23	Power supply, 560 W entry (models 61X 71X)	49P2139	FRU
23	Power supply, 560 W entry (models 11X 21X 31X 41X)	49P2028	FRU
	Power supply cage (models 6AX 6BX 7AX 7BX)	49P2157	FRU
	Hard disk drive, 36 G SCSI (models 6BX 7BX)	06P5778	CRU
	SCSI (RAID) card (models 6BX 7BX)	02R0970	CRU
	Foot, chassis (all models)	02R9308	CRU
	Filler, diskette drive (all models)	00N6407	CRU
	Cover, L cover (all models)	21P9665	CRU

Index	System (xSeries 235, Type 8671, Models 11X, 1AX, 21X, 2AX, 31X, 3AX, 41X, 4AX, 61X, 6AX, 6BX, 71X, 7AX, 7BX)	FRU No.	CRU/FRU
	Slide, diskette drive (all models)	00N6413	CRU
	Hot-swap card assembly (all models)	21P9672	FRU
	Lock assembly (all models)	00N6393	FRU
	Power cage assembly (models 1AX 2AX 3AX 4AX)	49P2025	CRU
	Clip, VRM (all models)	31P6026	CRU
	Slide, DASD (all models)	00N6412	FRU
	Mouse assembly (all models)	24P0383	CRU
	Battery, 3.0 volt (8590) (all models)	33F8354	CRU
	Bracket, tape backup (all models)	12J5681	CRU
	Thermal grease kit (all models)	59P4740	FRU
	Alcohol wipe kit (all models)	59P4739	FRU
	System service label (models 61X 6AX 6BX 71X 7AX 7BX)	02R9329	CRU
	System service label (all models)	59P4225	CRU
	Miscellaneous parts kit (all models) (contains: light pipes (4); EMC clips (5); 3.5 x 10 phillips screws (10); 3 x 8 Plastite screws (10); self-tap screws (5); power switch cover (2); diskette cable clamp (5); LED cable clamp (5); 3 x 10 screws (5); EMC springs (20); bumper feet (6); 8-16 Plastite screws (10); sire retainer links (2); serial number mount brackets (2); I/O blank tab brackets (5); card retainer latches (5); clamp assemblies (2); bezel (1); tape mounting kit (2); shadowbox shield (1); 3 x 3.6 screws (10); I cover latch spring (2); I cover latch pawl (2); shaft standoff (10); slotted 3.5 screws (10))	59P4204	FRU
	Power cord (all models)	6952300	CRU
	Cable, SCSI, 15.75 in (all models)	59P4201	CRU
	Cable, SCSI 10 in (all models)	59P4199	CRU
	Cable, SCSI 1-drop (all models)	21P9703	CRU
	Cable, IDE 2-drop (models 61X 6AX 6BX 71X 7AX 7BX)	02R9317	CRU
	Cable, serial (models 61X 6AX 6BX 71X 7AX 7BX)	02R2061	CRU
	Cable, blower (all models)	37L6063	CRU
	Cable, rear fan (all models)	21P9681	CRU
	Cable, fan (all models)	21P9684	CRU
	Cable, switch CD (all models)	21P9685	CRU
	Cable, single USB (all models)	21P9687	CRU
	Cable, IDE, CD-ROM drive (all models)	24P5085	CRU
	Cable, diskette drive (all models)	24P5069	CRU
	Cable, fan power, rear (models 61X 6AX 6BX 71X 7AX 7BX)	02R9301	CRU
	Cable, fan power, center (models 61X 6AX 6BX 71X 7AX 7BX)	02R9307	CRU
	Rack slide (optional)	02R9312	CRU

Keyboard CRUs

Keyboard	CRU No.
US English	37L2551
French Canadian	37L2552
LA Spanish	37L2553
Arabic	37L2555
Belgium/French	37L2556
Belgium/UK	37L2557
Bulgarian	37L2558
Czech	37L2559
Danish	37L2560
Dutch	37L2561
French	37L2562

Keyboard	CRU No.
German	37L2563
Greek	37L2564
Hebrew	37L2565
Hungarian	37L2566
Korean	02K0901
Iceland	37L2567
Italy	37L2568
Norwegian	37L2569
Polish	37L2570
Portuguese	37L2571
Romanian	37L2572
Russian	37L2573
Serbian/Cyrillic	37L2574
Slavic	37L2575
Spanish	37L2576
Swedish/Finn	37L2577
Swiss, French/German	37L2578
Turkish	37L2579
Turkish	37L2580
UK English	37L2581
Yugosl/Lat	37L2582
US English-EMEA	37L2583
Chinese/US	37L2585
Thailand	37L2587
French Canadian	37L0913

Power cord CRUs

For your safety, IBM provides a power cord with a grounded attachment plug to use with this IBM product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.

IBM power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).

For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.

For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.

IBM power cords for a specific country or region are usually available only in that country or region.

Power cord	CRU No.
Argentina, Australia, China (PRC), New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa	13F9940
Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Rep., Chad, China (Macau S.A.R.), Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe	13F9979
Denmark	13F9997
Bangladesh, Burma, Pakistan, South Africa, Sri Lanka	14F0015
Antigua, Bahrain, Brunei, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dubai, Fiji, Ghana, India, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia	14F0033
Liechtenstein, Switzerland	14F0051
Chile, Ethiopia, Italy, Libya, Somalia	14F0069
Israel	14F0087
Thailand	1838574
Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Korea (South), Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), United States of America, Venezuela	6952301

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This appendix contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your xSeries or IntelliStation® system, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system is turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system.
- Go to the IBM Support Web site at http://www.ibm.com/pc/support/ to check for technical information, hints, tips, and new device drivers.
- Use an IBM discussion forum on the IBM Web site to ask questions.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the publications that are provided with your system and software. The information that comes with your system also describes the diagnostic tests that you can perform. Most xSeries and IntelliStation systems, operating systems, and programs come with information that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the information for the operating system or program.

Using the documentation

Information about your IBM xSeries or IntelliStation system and preinstalled software, if any, is available in the documentation that comes with your system. That documentation includes printed books, online books, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.ibm.com/pc/support/ and follow the instructions. Also, you can order publications through the IBM Publications Ordering System at http://www.elink.ibmlink.ibm.com/public/applications/publications/cgibin/pbi.cgi.

Getting help and information from the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM xSeries and IntelliStation products, services, and support. The address for IBM xSeries information is http://www.ibm.com/eserver/xseries/. The address for IBM IntelliStation information is http://www.ibm.com/pc/intellistation/.

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You can find service information for your IBM products, including supported options, at http://www.ibm.com/pc/support/.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with xSeries servers, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, go to http://www.ibm.com/services/sl/products/.

For more information about Support Line and other IBM services, go to http://www.ibm.com/services/, or go to http://www.ibm.com/planetwide/ for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. Go to http://www.ibm.com/planetwide/ for support telephone numbers, or in the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

Appendix B. Related service information

Note: The service procedures are designed to help you isolate problems. They are written with the assumption that you have model-specific training on all computers, or that are familiar with the computers, functions, terminology, and service information provided in this manual.

Safety information

The following section contains the safety information that you need to be familiar with before servicing an IBM computer.

General safety

Follow these rules to ensure general safety:

- Observe good housekeeping in the area of the machines during and after maintenance.
- When lifting any heavy object:
  1. Ensure you can stand safely without slipping.
  2. Distribute the weight of the object equally between your feet.
  3. Use a slow lifting force. Never move suddenly or twist when you attempt to lift.
  4. Lift by standing or by pushing up with your leg muscles; this action removes the strain from the muscles in your back. *Do not attempt to lift any objects that weigh more than 16 kg (35 lb) or objects that you think are too heavy for you.*
- Do not perform any action that causes hazards to the customer, or that makes the equipment unsafe.
- Before you start the machine, ensure that other service representatives and the customer's personnel are not in a hazardous position.
- Place removed covers and other parts in a safe place, away from all personnel, while you are servicing the machine.
- Keep your tool case away from walk areas so that other people will not trip over it.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that your sleeves are fastened or rolled up above your elbows. If your hair is long, fasten it.
- Insert the ends of your necktie or scarf inside clothing or fasten it with a nonconductive clip, approximately 8 centimeters (3 inches) from the end.
- Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing.

  Remember: Metal objects are good electrical conductors.
- Wear safety glasses when you are: hammering, drilling soldering, cutting wire, attaching springs, using solvents, or working in any other conditions that might be hazardous to your eyes.
- After service, reinstall all safety shields, guards, labels, and ground wires. Replace any safety device that is worn or defective.
- Reinstall all covers correctly before returning the machine to the customer.

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Electrical safety

CAUTION:
Electrical current from power, telephone, and communication cables can be hazardous. To avoid personal injury or equipment damage, disconnect the attached power cords, telecommunication systems, networks, and modems before you open the server covers, unless instructed otherwise in the installation and configuration procedures.

Observe the following rules when working on electrical equipment.

Important: Use only approved tools and test equipment. Some hand tools have handles covered with a soft material that does not insulate you when working with live electrical currents.

Many customers have, near their equipment, rubber floor mats that contain small conductive fibers to decrease electrostatic discharges. Do not use this type of mat to protect yourself from electrical shock.

- Find the room emergency power-off (EPO) switch, disconnecting switch, or electrical outlet. If an electrical accident occurs, you can then operate the switch or unplug the power cord quickly.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.
- Disconnect all power before:
  - Performing a mechanical inspection
  - Working near power supplies
  - Removing or installing main units
- Before you start to work on the machine, unplug the power cord. If you cannot unplug it, ask the customer to power-off the wall box that supplies power to the machine and to lock the wall box in the off position.
- If you need to work on a machine that has exposed electrical circuits, observe the following precautions:
  - Ensure that another person, familiar with the power-off controls, is near you.

    Remember: Another person must be there to switch off the power, if necessary.
  - Use only one hand when working with powered-on electrical equipment; keep the other hand in your pocket or behind your back.

    Remember: There must be a complete circuit to cause electrical shock. By observing the above rule, you may prevent a current from passing through your body.
  - When using testers, set the controls correctly and use the approved probe leads and accessories for that tester.
  - Stand on suitable rubber mats (obtained locally, if necessary) to insulate you from grounds such as metal floor strips and machine frames.

  Observe the special safety precautions when you work with very high voltages; these instructions are in the safety sections of maintenance information. Use extreme care when measuring high voltages.
- Regularly inspect and maintain your electrical hand tools for safe operational condition.

- Do not use worn or broken tools and testers.
- *Never assume* that power has been disconnected from a circuit. First, *check* that it has been powered-off.
- Always look carefully for possible hazards in your work area. Examples of these hazards are moist floors, nongrounded power extension cables, power surges, and missing safety grounds.
- Do not touch live electrical circuits with the reflective surface of a plastic dental mirror. The surface is conductive; such touching can cause personal injury and machine damage.
- Do not service the following parts with the power on when they are removed from their normal operating places in a machine:
  - Power supply units
  - Pumps
  - Blowers and fans
  - Motor generators

  and similar units. (This practice ensures correct grounding of the units.)
- If an electrical accident occurs:
  - Use caution; do not become a victim yourself.
  - Switch off power.
  - Send another person to get medical aid.

Safety inspection guide

The intent of this inspection guide is to assist you in identifying potentially unsafe conditions on these products. Each machine, as it was designed and built, had required safety items installed to protect users and service personnel from injury. This guide addresses only those items. However, good judgment should be used to identify potential safety hazards due to attachment of non-IBM features or options not covered by this inspection guide.

If any unsafe conditions are present, you must determine how serious the apparent hazard could be and whether you can continue without first correcting the problem.

Consider these conditions and the safety hazards they present:

- Electrical hazards, especially primary power (primary voltage on the frame can cause serious or fatal electrical shock).
- Explosive hazards, such as a damaged CRT face or bulging capacitor
- Mechanical hazards, such as loose or missing hardware

The guide consists of a series of steps presented in a checklist. Begin the checks with the power off, and the power cord disconnected.

Checklist:

1. Check exterior covers for damage (loose, broken, or sharp edges).
2. Turn off the computer. Disconnect the power cord.
3. Check the power cord for:
   a. A third-wire ground connector in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and frame ground.

b. The power cord should be the appropriate type as specified in the parts listings.
c. Insulation must not be frayed or worn.

4. Remove the cover.
5. Check for any obvious non-IBM alterations. Use good judgment as to the safety of any non-IBM alterations.
6. Check inside the unit for any obvious unsafe conditions, such as metal filings, contamination, water or other liquids, or signs of fire or smoke damage.
7. Check for worn, frayed, or pinched cables.
8. Check that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Handling electrostatic discharge-sensitive devices

Any computer part containing transistors or integrated circuits (ICs) should be considered sensitive to electrostatic discharge (ESD). ESD damage can occur when there is a difference in charge between objects. Protect against ESD damage by equalizing the charge so that the server, the part, the work mat, and the person handling the part are all at the same charge.

Notes:

1. Use product-specific ESD procedures when they exceed the requirements noted here.
2. Make sure that the ESD-protective devices you use have been certified (ISO 9000) as fully effective.

When handling ESD-sensitive parts:

- Keep the parts in protective packages until they are inserted into the product.
- Avoid contact with other people.
- Wear a grounded wrist strap against your skin to eliminate static on your body.
- Prevent the part from touching your clothing. Most clothing is insulative and retains a charge even when you are wearing a wrist strap.
- Use the black side of a grounded work mat to provide a static-free work surface. The mat is especially useful when handling ESD-sensitive devices.
- Select a grounding system, such as those in the following list, to provide protection that meets the specific service requirement.

  Note: The use of a grounding system is desirable but not required to protect against ESD damage.

  – Attach the ESD ground clip to any frame ground, ground braid, or green-wire ground.
  – Use an ESD common ground or reference point when working on a double-insulated or battery-operated system. You can use coax or connector-outside shells on these systems.
  – Use the round ground-prong of the ac plug on ac-operated computers.

Grounding requirements

Electrical grounding of the computer is required for operator safety and correct system function. Proper grounding of the electrical outlet can be verified by a certified electrician.

Safety notices (multilingual translations)

The caution and danger safety notices in this section are provided in the following languages:

- English
- Brazilian/Portuguese
- Chinese
- French
- German
- Italian
- Japanese
- Korean
- Spanish

Important: All caution and danger statements in this IBM documentation begin with a number. This number is used to cross reference an English caution or danger statement with translated versions of the caution or danger statement in this section.

For example, if a caution statement begins with a number 1, translations for that caution statement appear in this section under statement 1.

Be sure to read all caution and danger statements before performing any of the instructions.

- Statement 1

DANGER

Electrical current from power, telephone and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedure**s.
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect	To Disconnect
1. Turn everything OFF. 2. First, attach all cables to devices. 3. Attach signal cables to connectors. 4. Attach power cords to outlet. 5. Turn device ON.	1. Turn everything OFF. 2. First, remove power cords from outlet. 3. Remove signal cables from connectors. 4. Remove all cables from devices.

- Statement 2

CAUTION:
When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:
- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

- Statement 3

CAUTION:
When laser products (such as CD-ROMs, DVD-ROM drives, fiber optic devices, or transmitters) are installed, note the following:
- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER: Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following:

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

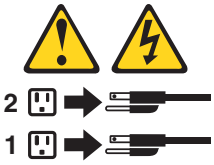
- Statement 4

≥18 kg (37 lbs) ≥32 kg (70.5 lbs) ≥55 kg (121.2 lbs)

CAUTION:
Use safe practices when lifting.

- Statement 5

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



- Statement 10

CAUTION:

Do not place any object weighing more than 82 kg (180 lbs.) on top of rack-mounted devices.

Importante:

Todas as instruções de cuidado e perigo da IBM documentation começam com um número. Este número é utilizado para fazer referência cruzada de uma instrução de cuidado ou perigo no idioma inglês com as versões traduzidas das instruções de cuidado ou perigo encontradas nesta seção.

Por exemplo, se uma instrução de cuidado é iniciada com o número 1, as traduções para aquela instrução de cuidado aparecem nesta seção sob a instrução 1.

Certifique-se de ler todas as instruções de cuidado e perigo antes de executar qualquer operação.

- Instrução 1

PERIGO

A corrente elétrica proveniente de cabos de alimentação, de telefone e de comunicações é perigosa.

Para evitar risco de choque:
- Não conecte ou desconecte cabos e não realize instalação, manutenção ou reconfiguração deste produto durante uma tempestade com raios.
- Conecte todos os cabos de alimentação a tomadas elétricas corretamente instaladas e aterradas.
- Conecte todos os equipamentos ao qual esse produto será conectado a tomadas corretamente instaladas.
- Sempre que possível, utilize apenas uma das mãos para conectar ou desconectar cabos de sinal.
- Nunca ligue qualquer equipamento quando existir evidência de danos por fogo, água ou na estrutura.
- Desconecte cabos de alimentação, sistemas de telecomunicação, redes e modems antes de abrir as tampas dos dispositivos, a menos que especificado de maneira diferente nos procedimentos de instalação e configuração.
- Conecte e desconecte cabos conforme descrito na seguinte tabela, ao instalar ou movimentar este produto ou os dispositivos conectados, ou ao abrir suas tampas.

Para Conectar:	**Para Desconectar:**
1. DESLIGUE Tudo. 2. Primeiramente, conecte todos os cabos aos dispositivos. 3. Conecte os cabos de sinal aos conectores. 4. Conecte os cabos de alimentação às tomadas. 5. LIGUE os dispositivos.	1. DESLIGUE Tudo. 2. Primeiramente, remova os cabos de alimentação das tomadas. 3. Remova os cabos de sinal dos conectores. 4. Remova todos os cabos dos dispositivos.

- Instrução 2

CUIDADO:

Ao substituir a bateria de lítio, utilize apenas uma bateria IBM, Número de Peça 33F8354 ou uma bateria de tipo equivalente, recomendada pelo fabricante. Se o seu sistema possui um móídulo com uma bateria de lítio, substitua-o apenas pelo mesmo tipo de mídulo, do mesmo fabricante. A bateria contém lítio e pode explodir se não for utilizada, manuseada e descartada de maneira correta.

Não:
- Jogue ou coloque na água
- Aqueça a mais de 100°C (212°F)
- Conserte nem desmonte

Para descartar a bateria, entre em contato com a área de atendimento a clientes IBM, pelo telefone (011) 889-8986, para obter informações sobre como enviar a bateria pelo correio para a IBM.

- Instrução 3

PRECAUCIÓN:

Quando produtos a laser (unidades de CD-ROM, unidades de DVD, dispositivos de fibra ítica, transmissores, etc.) estiverem instalados, observe o seguinte:
- Não remova as tampas. A remoção das tampas de um produto a laser pode resultar em exposição prejudicial à radiação de laser. Nenhuma peça localizada no interior do dispositivo pode ser consertada.
- A utilização de controles ou ajustes ou a execução de procedimentos diferentes dos especificados aqui pode resultar em exposição prejudicial à radiação.

PERIGO

Alguns produtos a laser contêm um diodo laser da Classe 3A ou Classe 3B embutido. Observe o seguinte:

Radiação de laser quando aberto. Não olhe diretamente para o raio a olho nu ou com instrumentos íticos, e evite exposição direta ao raio.

- Instrução 4

≥18 kg (37 lbs) ≥32 kg (70.5 lbs) ≥55 kg (121.2 lbs)

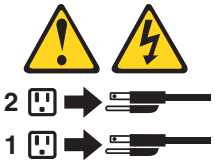
CUIDADO:

Ao levantar a máquina, faça-o com segurança.

- Instrução 5

CUIDADO:

Os botões Liga/Desliga localizados no dispositivo e na fonte de alimentação não desligam a corrente elétrica fornecida ao dispositivo. O dispositivo também pode ter mais de um cabo de alimentação. Para remover toda a corrente elétrica do dispositivo, assegure que todos os cabos de alimentação estejam desconectados da fonte de energia elétrica.



- Instrução 10

CUIDADO:

Não coloque nenhum objeto com peso superior a 82 kg (180 lbs.) sobre dispositivos montados em rack.

重要：

Server Library 中的所有提醒和危险条款前都有一个数字标识。该数字是用来交叉引用一个英文的提醒和危险条款及本部分中的与之对应的已翻译成其它文字的提醒和危险条款。

例如，如果一个提醒条款前的数字为 1，则本部分中相应的译文也带有标号 1。

在执行任何指示的操作之前，请确保您已经阅读了全部提醒和危险条款。

声明 1

危险

电源、电话和通信电缆中带有危险电流。

为避免电击：

雷电期间不要拆接电缆或安装、维修及重新配置本产品。

将所有电源线连接至正确布线并已安全接地的电源插座上。

将应与本产品连接的所有设备连接至正确布线的插座上。

尽量只使用单手拆接信号电缆。

有水、火及结构损坏迹象时，请勿打开任何设备。

除非在安装配置过程中有明确指示，否则，打开设备机盖前应先断开与电源线、远程通信系统、网络和调制解调器的所有连接。

安装、移动或打开本产品及其附带设备的机盖时，应按下表所述连接和断开电缆。

连接时：	断开连接时：
1. 关闭所有设备。	1. 关闭所有设备。
2. 首先将所有电缆连接至设备。	2. 首先从插座中拔出电源线。
3. 将信号电缆连接至接口。	3. 从接口上拔下信号电缆。
4. 将电源线连接至插座。	

声明 2

警告：

更换锂电池时，只能使用 IBM 产品号 33F8354 或者是厂商推荐的等同类型的电池。

如果系统模块中含有锂电池，则只能使用同一厂商制造的同一类型的模块进行更换。电池中含有锂，如果使用、拿放或处理不当，可能会发生爆炸。

请勿对电池进行下列操作：
扔入或浸入水电 °
加热超过 100 （212 F）
进行修理或分解
请按本地法规要求处理电池。

声明 3

警告：

安装激光产品（如 CD-ROM、DVD 驱动器、光纤设备或送话器）时，应注意以下事项：

不要拆除外盖。拆除激光产品的外盖可能会导致激光辐射的危险，本设备中没有用户可维修的部件。

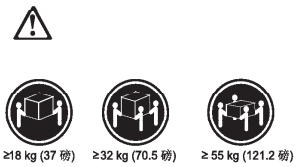
非此处指定的其它控制、调整或与性能有关的操作都有可能导致激光辐射的危险。

危险

某些激光产品中包含内嵌的 3A 级或 3B 级激光二极管。请注意以下事项。

打开时会产生激光辐射。不要直视光束，不要使用光学仪器直接观看光束，避免直接暴露于光束之下。

声明 4

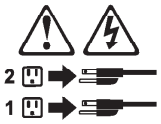


警告：
抬起时请采用安全操作方法。

声明 5

警告：

使用设备上的电源控制按钮和电源上的开关都不能断开本设备上的电流。另外，本设备可能带有多条电源线。如要断开设备上的所有电流，请确保所有电源线均已与电源断开连接。



声明 6

警告：

如果在电源线连接设备的一端安装了固定松紧夹，则必须将电源线的另一端连接至使用方便的电源。

声明 7

警告：

如果设备带有外门，则在移动或抬起设备前应将其拆除或固定以避免造成人员伤害。外门支撑不了设备的重量。

声明 8

警告：
不要拆除电源外盖或贴有下列标签的任何部件。

贴有此标签的组件内部存在高电压、高电流的危险。这些组件中没有用户可维修的部件。如果怀疑其中的部件存在问题，应与服务技术人员联系。

声明 9

警告：

为避免人员伤害，拆除设备上的风扇前应拔下热插拔风扇电缆。

声明 10

警告：

机柜安装的设备上面不能放置重于 82kg（180 磅）的物品。

>82 kg (180 磅)

声明 11

警告：

下面的标签表明附近有锋利的边、角或接头。

声明 12

警告：
下面的标签表明附近有高热表面。

重要資訊：

Server Library 中所有「注意」及「危險」的聲明均以數字開始。此一數字是用來作為交互參考之用，英文「注意」或「危險」聲明可在本節中找到相同內容的「注意」或「危險」聲明的譯文。

例如，有一「危險」聲明以數字 1 開始，則該「危險」聲明的譯文將出現在本節的「聲明」1 中。

執行任何指示之前，請詳讀所有「注意」及「危險」的聲明。

聲明 1

危險

電源、電話及通信電纜上所產生的電流均有危險性。

欲避免電擊危險：

- 在雷雨期間，請勿連接或切斷本產品上的任何電纜線，或安裝、維修及重新架構本產品。
- 請將電源線接至接線及接地正確的電源插座。
- 請將本產品隨附的設備連接至接線正確的插座。
- 儘可能使用單手來連接或切斷信號電纜線。
- 當設備有火燒或泡水的痕跡，或有結構性損害時，請勿開啓該設備的電源。
- 在安裝及架構之時，若非非常熟悉，在開啓裝置蓋子之前，請切斷電源線、電信系統、網路及數據機。
- 在安裝、移動本產品或附加裝置，或開啓其蓋子時，請依照下表中「連接」及「切斷」電纜線的步驟執行。

連接：	切斷：
1. 關閉所有開關。	1. 關閉所有開關。
2. 先將所有電纜線接上裝置。	2. 先自電源插座拔掉電源線。
3. 將信號電纜接上接頭。	3. 拔掉接頭上的所有信號電纜。
4. 再將電源線接上電源插座。	4. 再拔掉裝置上的所有電纜線。
5. 開啓裝置的電源。	

聲明 2

注意：

更換鋰電池時，只可使用 IBM 零件編號 33F8354 的電池，或製造商建議之相當類型的電池。若系統中具有包含鋰電池的模組，在更換此模組時，請使用相同廠商製造的相同模組類型。如未正確使用、處理或丟棄含有鋰的電池時，可能會引發爆炸。

請勿將電池：

- 丟入或浸入水中
- 加熱超過 100 ℃ (212 ℉)
- 修理或拆開

請遵照當地法令規章處理廢棄電池。

聲明 3

注意：

安裝雷射產品 (如 CD-ROM、DVD 光碟機、光纖裝置或發射器) 時，請注意下列事項：

- 請勿移開蓋子。移開雷射產品的蓋子，您可能會暴露於危險的雷射輻射之下。裝置中沒有需要維修的組件。
- 不依此處所指示的控制、調整或處理步驟，您可能會暴露於危險的輻射之下。

危險

有些雷射產品含有內嵌式 Class 3A 或 Class 3B 雷射二極體。請注意下列事項：

開啓時會產生雷射輻射。請勿凝視光束，不要使用光學儀器直接觀察，且應避免直接暴露在光束下。

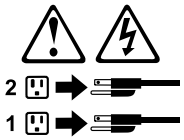
聲明 4

≥ 18 公斤 (37 磅) ≥ 32 公斤 (70.5 磅) ≥ 55 公斤 (121.2 磅)

注意：
抬起裝置時，請注意安全措施。

聲明 5

注意：
裝置上的電源控制按鈕及電源供應器上的電源開關均無法關閉裝置上的電流。
本裝置可能有一條以上的電源線。如要移除裝置上的所有電流，請確認所有電源線已與電源分離。



聲明 10

注意：
請勿將任何重量超過 82 公斤 (180 磅) 的物品置於已安裝機架的裝置上方。

>82 公斤 (180 磅)

Important:

Toutes les consignes Attention et Danger indiquées dans la bibliothèque IBM documentation sont précédées d'un numéro. Ce dernier permet de mettre en correspondance la consigne en anglais avec ses versions traduites dans la présente section.

Par exemple, si une consigne de type Attention est précédée du chiffre 1, ses traductions sont également précédées du chiffre 1 dans la présente section.

Prenez connaissance de toutes les consignes de type Attention et Danger avant de procéder aux opérations décrites par les instructions.

- Notice n° 1

DANGER

Le courant électrique passant dans les câbles de communication, ou les cordons téléphoniques et d'alimentation peut être dangereux.

Pour éviter tout risque de choc électrique:

- Ne manipulez aucun câble et n'effectuez aucune opération d'installation, d'entretien ou de reconfiguration de ce produit au cours d'un orage.
- Branchez tous les cordons d'alimentation sur un socle de prise de courant correctement câblé et mis à la terre.
- Branchez sur des socles de prise de courant correctement câblés tout équipement connecté à ce produit.
- Lorsque cela est possible, n'utilisez qu'une seule main pour connecter ou déconnecter les câbles d'interface.
- Ne mettez jamais un équipement sous tension en cas d'incendie ou d'inondation, ou en présence de dommages matériels.
- Avant de retirer les carters de l'unité, mettez celle-ci hors tension et déconnectez ses cordons d'alimentation, ainsi que les câbles qui la relient aux réseaux, aux systèmes de télécommunication et aux modems (sauf instruction contraire mentionnée dans les procédures d'installation et de configuration).
- Lorsque vous installez ou que vous déplacez le présent produit ou des périphériques qui lui sont raccordés, reportez-vous aux instructions ci-dessous pour connecter et déconnecter les différents cordons.

Connexion	Déconnexion
1. Mettez les unités hors tension. 2. Commencez par brancher tous les cordons sur les unités. 3. Branchez les câbles d'interface sur des connecteurs. 4. Branchez les cordons d'alimentation sur des prises. 5. Mettez les unités sous tension.	1. Mettez les unités hors tension. 2. Débranchez les cordons d'alimentation des prises. 3. Débranchez les câbles d'interface des connecteurs. 4. Débranchez tous les câbles des unités.

- Notice n° 2

ATTENTION:

Remplacez la pile au lithium usagée par une pile de référence identique exclusivement - voir la référence IBM - ou par une pile équivalente recommandée par le fabricant. Si votre système est doté d'un module contenant une pile au lithium, vous devez le remplacer uniquement par un module identique, produit par le même fabricant. La pile contient du lithium et présente donc un risque d'explosion en cas de mauvaise manipulation ou utilisation.

- **Ne la jetez pas à l'eau.**
- **Ne l'exposez pas à une température supérieure à 100 °C.**
- **Ne cherchez pas à la réparer ou à la démonter.**

Pour la mise au rebut, reportez-vous à la réglementation en vigueur.

- Notice n° 3

ATTENTION:

Si des produits laser sont installés (tels que des unités de CD-ROM ou de DVD, des périphériques contenant des fibres optiques ou des émetteurs-récepteurs), prenez connaissance des informations suivantes:

- **N'ouvrez pas ces produits pour éviter une exposition directe au rayon laser. Vous ne pouvez effectuer aucune opération de maintenance à l'intérieur.**
- **Pour éviter tout risque d'exposition au rayon laser, respectez les consignes de réglage et d'utilisation des commandes, ainsi que les procédures décrites dans le présent document.**

DANGER

Certains produits laser contiennent une diode laser de classe 3A ou 3B. Prenez connaissance des informations suivantes:

Rayonnement laser lorsque le carter est ouvert. évitez de regarder fixement le faisceau ou de l'observer à l'aide d'instruments optiques. évitez une exposition directe au rayon.

- Notice n° 4

≥18 kg (37 lbs) ≥32 kg (70.5 lbs) ≥55 kg (121.2 lbs)

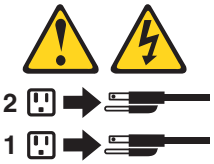
ATTENTION:

Faites-vous aider pour soulever ce produit.

- Notice n° 5

ATTENTION:

Le bouton de mise sous tension/hors tension de l'unité et l'interrupteur d'alimentation du bloc d'alimentation ne coupent pas l'arrivée de courant électrique à l'intérieur de la machine. Il se peut que votre unité dispose de plusieurs cordons d'alimentation. Pour isoler totalement l'unité du réseau électrique, débranchez tous les cordons d'alimentation des socles de prise de courant.



- Notice n° 10

ATTENTION:

Ne posez pas d'objet dont le poids dépasse 82 kg sur les unités montées en armoire.

Wichtig:

Alle Sicherheitshinweise in dieser IBM documentation beginnen mit einer Nummer. Diese Nummer verweist auf einen englischen Sicherheitshinweis mit den übersetzten Versionen dieses Hinweises in diesem Abschnitt.

Wenn z. B. ein Sicherheitshinweis mit der Nummer 1 beginnt, so erscheint die übersetzung für diesen Sicherheitshinweis in diesem Abschnitt unter dem Hinweis 1.

Lesen Sie alle Sicherheitshinweise, bevor Sie eine Anweisung ausführen.

- Hinweis 1

VORSICHT

Elektrische Spannungen von Netz-, Telefon- und Datenübertragungsleitungen sind gefährlich.

Aus Sicherheitsgründen:

- Bei Gewitter an diesem Gerät keine Kabel anschließen oder lösen. Ferner keine Installations-, Wartungs- oder Rekonfigurationsarbeiten durchführen.
- Gerät nur an eine Schutzkontaktsteckdose mit ordnungsgemäß geerdetem Schutzkontakt anschließen.
- Alle angeschlossenen Geräte ebenfalls an Schutzkontaktsteckdosen mit ordnungsgemäß geerdetem Schutzkontakt anschließen.
- Signalkabel möglichst einhändig anschließen oder lösen.
- Keine Geräte einschalten, wenn die Gefahr einer Beschädigung durch Feuer, Wasser oder andere Einflüsse besteht.
- Die Verbindung zu den angeschlossenen Netzkabeln, Telekommunikationssystemen, Netzwerken und Modems ist vor dem öffnen des Gehäuses zu unterbrechen. Es sei denn, dies ist in den zugehörigen Installations- und Konfigurationsprozeduren anders angegeben.
- Nur nach den nachfolgend aufgeführten Anweisungen arbeiten, die für Installation, Transport oder öffnen von Gehäusen von Personal Computern oder angeschlossenen Einheiten gelten.

Kabel anschließen:	**Kabel lösen:**
1. Alle Geräte ausschalten und Netzstecker ziehen. 2. Zuerst alle Kabel an Einheiten anschließen. 3. Signalkabel an Anschlußbuchsen anschließen. 4. Netzstecker an Steckdose anschließen. 5. Gerät einschalten.	1. Alle Geräte ausschalten. 2. Zuerst Netzstecker von Steckdose lösen. 3. Signalkabel von Anschlußbuchsen lösen. 4. Alle Kabel von Einheiten lösen.

- Hinweis 2

ACHTUNG:

Eine verbrauchte Batterie nur durch eine Batterie mit der IBM Teilenummer 33F8354 oder durch eine vom Hersteller empfohlene Batterie ersetzen. Wenn Ihr System ein Modul mit einer Lithium-Batterie enthält, ersetzen Sie es immer mit dem selben Modultyp vom selben Hersteller. Die Batterie enthält Lithium und kann bei unsachgemäßer Verwendung, Handhabung oder Entsorgung explodieren.

Die Batterie nicht:

- mit Wasser in Berührung bringen.
- über 100 C erhitzen.
- reparieren oder zerlegen.

Die örtlichen Bestimmungen für die Entsorgung von Sondermüll beachten.

- Hinweis 3

ACHTUNG:

Wenn ein Laserprodukt (z. B. CD-ROM-Laufwerke, DVD-Laufwerke, Einheiten mit Glasfaserkabeln oder Transmitter) installiert ist, beachten Sie folgendes.

- Das Entfernen der Abdeckungen des CD-ROM-Laufwerks kann zu gefährlicher Laserstrahlung führen. Es befinden sich keine Teile innerhalb des CD-ROM-Laufwerks, die vom Benutzer gewartet werden müssen. Die Verkleidung des CD-ROM-Laufwerks nicht öffnen.
- Steuer- und Einstellelemente sowie Verfahren nur entsprechend den Anweisungen im vorliegenden Handbuch einsetzen. Andernfalls kann gefährliche Laserstrahlung auftreten.

VORSICHT

Manche CD-ROM-Laufwerke enthalten eine eingebaute Laserdiode der Klasse 3A oder 3B. Die nachfolgend aufgeführten Punkte beachten.

Laserstrahlung bei geöffneter Tür. Niemals direkt in den Laserstrahl sehen, nicht direkt mit optischen Instrumenten betrachten und den Strahlungsbereich meiden.

- Hinweis 4

≥18 kg ≥32 kg ≥55 kg

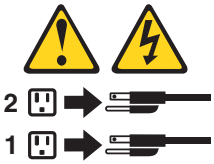
ACHTUNG:

Beim Anheben der Maschine die vorgeschriebenen Sicherheitsbestimmungen beachten.

- Hinweis 5

ACHTUNG:

Mit dem Betriebsspannungsschalter an der Vorderseite des Servers und dem Betriebsspannungsschalter am Netzteil wird die Stromversorgung für den Server nicht unterbrochen. Der Server könnte auch mehr als ein Netzkabel aufweisen. Um die gesamte Stromversorgung des Servers auszuschalten, muß sichergestellt werden, daß alle Netzkabel aus den Netzsteckdosen herausgezogen wurden.



- Hinweis 10

ACHTUNG:

Keine Gegenstände, die mehr als 82 kg wiegen, auf Rack-Einheiten ablegen.

Importante:

Tutti gli avvisi di attenzione e di pericolo riportati nella pubblicazione IBM documentation iniziano con un numero. Questo numero viene utilizzato per confrontare avvisi di attenzione o di pericolo in inglese con le versioni tradotte riportate in questa sezione.

Ad esempio, se un avviso di attenzione inizia con il numero 1, la relativa versione tradotta è presente in questa sezione con la stessa numerazione.

Prima di eseguire una qualsiasi istruzione, accertarsi di leggere tutti gli avvisi di attenzione e di pericolo.

- Avviso 1

PERICOLO

La corrente elettrica circolante nei cavi di alimentazione, del telefono e di segnale è pericolosa.

Per evitare il pericolo di scosse elettriche:

- Non collegare o scollegare i cavi, non effettuare l'installazione, la manutenzione o la riconfigurazione di questo prodotto durante i temporali.
- Collegare tutti i cavi di alimentazione ad una presa elettrica correttamente cablata e munita di terra di sicurezza.
- Collegare qualsiasi apparecchiatura collegata a questo prodotto ad una presa elettrica correttamente cablata e munita di terra di sicurezza.
- Quando possibile, collegare o scollegare i cavi di segnale con una sola mano.
- Non accendere qualsiasi apparecchiatura in presenza di fuoco, acqua o se sono presenti danni all'apparecchiatura stessa.
- Scollegare i cavi di alimentazione, i sistemi di telecomunicazioni, le reti e i modem prima di aprire i coperchi delle unità, se non diversamente indicato nelle procedure di installazione e configurazione.
- Collegare e scollegare i cavi come descritto nella seguente tabella quando si effettuano l'installazione, la rimozione o l'apertura dei coperchi di questo prodotto o delle unità collegate.

Per collegare:	**Per scollegare:**
1. SPEGNERE tutti i dispositivi. 2. Collegare prima tutti i cavi alle unità. 3. Collegare i cavi di segnale ai connettori. 4. Collegare i cavi di alimentazione alle prese elettriche. 5. ACCENDERE le unità.	1. SPEGNERE tutti i dispositivi. 2. Rimuovere prima i cavi di alimentazione dalle prese elettriche. 3. Rimuovere i cavi di segnale dai connettori. 4. Rimuovere tutti i cavi dalle unità.

- Avviso 2

ATTENZIONE:

Quando si sostituisce la batteria al litio, utilizzare solo una batteria IBM con numero parte 33F8354 o batterie dello stesso tipo o di tipo equivalente consigliate dal produttore. Se il sistema di cui si dispone è provvisto di un modulo contenente una batteria al litio, sostituire tale batteria solo con un tipo di modulo uguale a quello fornito dal produttore. La batteria contiene litio e può esplodere se utilizzata, maneggiata o smaltita impropriamente.

Evitare di:

- Gettarla o immergerla in acqua
- Riscaldarla ad una temperatura superiore ai 100°C
- Cercare di ripararla o smontarla

Smaltire secondo la normativa in vigore (D.Lgs 22 del 5/2/9) e successive disposizioni nazionali e locali.

- Avviso 3

ATTENZIONE:

Quando si installano prodotti laser come, ad esempio, le unità DVD, CD-ROM, a fibre ottiche o trasmettitori, prestare attenzione a quanto segue:

- Non rimuovere i coperchi. L'apertura dei coperchi di prodotti laser può determinare l'esposizione a radiazioni laser pericolose. All'interno delle unità non vi sono parti su cui effettuare l'assistenza tecnica.
- L'utilizzo di controlli, regolazioni o l'esecuzione di procedure non descritti nel presente manuale possono provocare l'esposizione a radiazioni pericolose.

PERICOLO

Alcuni prodotti laser contengono all'interno un diodo laser di Classe 3A o Classe 3B. Prestare attenzione a quanto segue:

Aprendo l'unità vengono emesse radiazioni laser. Non fissare il fascio, non guardarlo direttamente con strumenti ottici ed evitare l'esposizione diretta al fascio.

- Avviso 4

≥18 kg ≥32 kg ≥55 kg

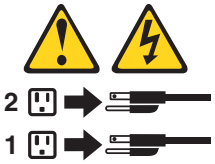
ATTENZIONE:

Durante il sollevamento della macchina seguire delle norme di sicurezza.

- Avviso 5

ATTENZIONE:

Il pulsante del controllo dell'alimentazione situato sull'unità e l'interruttore di alimentazione posto sull'alimentatore non disattiva la corrente elettrica fornita all'unità. L'unità potrebbe disporre di più di un cavo di alimentazione. Per disattivare la corrente elettrica dall'unità, accertarsi che tutti i cavi di alimentazione siano scollegati dalla sorgente di alimentazione.



- Avviso 10

ATTENZIONE:

Non poggiare oggetti che pesano più di 82 kg sulla parte superiore delle unità montate in rack.

重要：

Netfinity Server　ライブラリーにあるすべての注意および危険の記述は数字で始まります。この数字は、英語版の注意および危険の記述と翻訳された注意および危険の記述を相互参照するために使用します。

例えば、もし注意の記述が数字の 1 で始まってる場合は、その注意の翻訳は、記述 1　の下にあります。

手順を実施する前に、すべての注意;

・記述　1

⚠ 危険

感電を防止するため、雷の発生時には、いかなるケーブルの取り付けまたは取り外しも行わないでください。また導入、保守、再構成などの作業も行わないでください。

感電を防止するため ：

- 電源コードは正しく接地および配線が行われている電源に接続してください。
- 本製品が接続されるすべての装置もまた正しく配線された電源に接続されている必要があります。

できれば、信号ケーブルに取り付けまたは取り外しのときは片方の手のみで行うようにしてください。これにより、電位差がある二つの表面に触ることによる感電を防ぐことができます。

電源コード、電話ケーブル、通信ケーブルからの電流は身体に危険を及ぼします。設置、移動、または製品のカバーを開けたり装置を接続したりするときには、以下のようにケーブルの接続 、取り外しを行ってください。

接続するには	取り外すには
1. すべての電源を切る	1. すべての電源を切る
2. まず、装置にすべてのケーブルを接続する。	2. まず、電源コンセントから電源コードを取り外す
3. 次に、通信ケーブルをコネクターに接続する	3. 次に、通信ケーブルをコネクターから取り外す。
4. その後、電源コンセントに電源コードを接続する	4. その後、装置からすべてのケーブルを取り外す
5. 装置の電源を入れる。	

・記述 2

⚠ 注意

本製品には、システム・ボード上にリチウム電池が使用されています。電池の交換方法や取り扱いを誤ると、発熱、発火、破裂のおそれがあります。
電池の交換には、IBM部品番号33F8354の電池またはメーカー推奨の同等の電池を使用してください。
交換用電池の購入については、お買い求めの販売店または弊社の営業担当までお問い合わせください。
電池は幼児の手の届かない所に置いてください。
万一、幼児が電池を飲み込んだときは、直ちに医師に相談してください。
以下の行為は絶対にしないでください。
－水にぬらすこと
－100度C 以上の過熱や焼却
－分解や充電
－ショート
電池を廃棄する場合、および保存する場合にはテープなどで絶縁してください。他の金属や電池と混ざると発火、破裂の原因となります。電池は地方自治体の条例、または規則に従って廃棄してください。ごみ廃棄場で処分されるごみの中に捨てないでください。

・記述 3

⚠ 注意

レーザー製品(CD-ROM、DVD、または光ファイバー装置または送信器など)が組み込まれている場合は、下記に御注意ください。

- ここに記載されている制御方法、調整方法、または性能を超えて使用すると、危険な放射線を浴びる可能性があります。
- ドライブのカバーを開けると、危険な放射線を浴びる可能性があります。ドライブの内部に修理のために交換可能な部品はありません。カバーを開けないでください。

⚠ 危険

一部 CD-ROM ドライブは、Class 3A または Class 3B レーザー・ダイオードを使用しています。次の点に注意してください。

CD-ROMドライブのカバーを開けるとレーザーが放射されます。光線をみつめたり、光学器械を使って直接見たりしないでください。また直接光線を浴びないようにしてください。

・記述 4

⚠ 注意

18Kg 以上

32Kg 以上

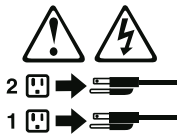
55Kg 以上

装置を持ち上げる場合は、安全に持ち上げる方法に従ってください。

・記述 5

⚠ 注意 ⚠

サーバーの前面にある電源制御ボタンは、サーバーに供給された
電流を遮断しません。
サーバーには、複数の電源コードが接続されているかもしれません。
サーバーから電流を完全に遮断するために、すべての電源コードが
電源から取り外されていることを確認してください。



・記述 10

⚠ 注意

ラック・モデルのサーバーの上に 82 Kg 以上の物を置かないで
ください。

중요:

본 *Server Library*에 있는 모든 주의 및 위험 경고문은 번호로 시작합니다. 이 번호는 영문 주의 혹은 위험 경고문과 이 절에 나오는 번역된 버전의 주의 혹은 위험 경고문을 상호 참조하는 데 사용됩니다.

예를 들어, 주의 경고문이 번호 1로 시작하면, 번역된 해당 주의 경고문을 본 절의 경고문 1에서 찾아볼 수 있습니다.

모든 지시사항을 수행하기 전에 반드시 모든 주의 및 위험 경고문을 읽으십시오.

경고문 1

위험

전원, 전화 및 통신 케이블로부터 흘러 나오는 전류는 위험합니다.

전기 충격을 피하려면:

- 뇌우를 동반할 때는 케이블의 연결이나 철수, 이 제품의 설치, 유지보수 또는 재구성을 하지 마십시오.
- 모든 전원 코드를 적절히 배선 및 접지해야 합니다.
- 이 제품에 연결될 모든 장비를 적절하게 배선된 콘센트에 연결하십시오.
- 가능한한 신호 케이블을 한 손으로 연결하거나 끊으십시오.
- 화재, 수해 또는 구조상의 손상이 있을 경우 장비를 켜지 마십시오.
- 설치 및 구성 프로시저에 다른 설명이 없는 한, 장치 덮개를 열기 전에 연결된 전원 코드, 원거리 통신 시스템, 네트워크 및 모뎀을 끊어 주십시오.
- 제품 또는 접속된 장치를 설치, 이동 및 덮개를 열 때 다음 설명에 따라 케이블을 연결하거나 끊도록 하십시오.

연결하려면:	연결을 끊으려면:
1. 모든 스위치를 끕니다.	1. 모든 스위치를 끕니다.
2. 먼저 모든 케이블을 장치에 연결합니다.	2. 먼저 콘센트에서 전원 코드를 뽑습니다.
3. 신호 케이블을 커넥터에 연결합니다.	3. 신호 케이블을 커넥터에서 제거합니다.
4. 콘센트에 전원 코드를 연결합니다.	4. 장치에서 모든 케이블을 제거합니다.
5. 장치 스위치를 켭니다.	

경고문 2

주의:

리튬 배터리를 교체할 때는 IBM 부품 번호 33F8354 또는 제조업체에서 권장하는 동등한 유형의 배터리를 사용하십시오. 시스템에 리튬 배터리를 갖고 있는 모듈이 있으면 동일한 제조업체에서 생산된 동일한 모듈 유형으로 교체하십시오. 배터리에 리튬이 있을 경우 제대로 사용, 처리 또는 처분하지 않으면 폭발할 수 있습니다.

다음을 주의하십시오.

- 던지거나 물에 담그지 않도록 하십시오.
- 100°C(212°F) 이상으로 가열하지 마십시오.
- 수리하거나 분해하지 마십시오.

지역 법령이나 규정의 요구에 따라 배터리를 처분하십시오.

경고문 3

주의:
레이저 제품(CD-ROMs, DVD 드라이브, 광 장치 또는 트랜스미터 등과 같은)이 설치되어 있을 경우 다음을 유의하십시오.

- 덮개를 제거하지 마십시오. 레이저 제품의 덮개를 제거했을 경우 위험한 레이저 광선에 노출될 수 있습니다. 이 장치 안에는 서비스를 받을 수 있는 부품이 없습니다.

- 여기에서 지정하지 않은 방식의 제어, 조절 또는 실행으로 인해 위험한 레이저 광선에 노출될 수 있습니다.

위험

일부 레이저 제품에는 클래서 3A 또는 클래스 3B 레이저 다이오드가 들어 있습니다. 다음을 주의하십시오.

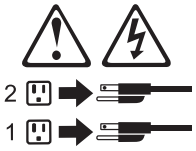
열면 레이저 광선에 노출됩니다. 광선을 주시하거나 광학 기계를 직접 쳐다보지 않도록 하고 광선에 노출되지 않도록 하십시오.

경고문 4

주의:
기계를 들 때는 안전하게 들어 올리십시오.

경고문 5

주의:
장치의 전원 제어 버튼 및 전원 공급기의 전원 스위치는 장치에 공급되는 전류를 차단하지 않습니다. 장치에 둘 이상의 전원 코드가 연결되어 있을 수도 있습니다. 장치에서 모든 전류를 차단하려면 모든 전원 코드가 전원으로부터 차단되어 있는 지 확인하십시오.



경고문 10

주의:
서랍형 모델의 장치 상단에 82 kg(180 lbs.)이 넘는 물체를 올려 놓지 마십시오.

Importante:

Todas las declaraciones de precauciín de esta IBM documentation empiezan con un número. Dicho número se emplea para establecer una referencia cruzada de una declaraciín de precauciín o peligro en inglés con las versiones traducidas que de dichas declaraciones pueden encontrarse en esta secciín.

Por ejemplo, si una declaraciín de peligro empieza con el número 1, las traducciones de esta declaraciín de precauciín aparecen en esta secciín bajo Declaraciín 1.

Lea atentamente todas las declaraciones de precauciín y peligro antes de llevar a cabo cualquier operaciín.

- Declaración 1

PELIGRO

La corriente eléctrica de los cables telefínicos, de alimentaciín y de comunicaciones es perjudicial.

Para evitar una descarga eléctrica:

- No conecte ni desconecte ningún cable ni realice las operaciones de instalaciín, mantenimiento o reconfiguraciín de este producto durante una tormenta.
- Conecte cada cable de alimentaciín a una toma de alimentaciín eléctrica con conexiín a tierra y cableado correctos.
- Conecte a tomas de alimentaciín con un cableado correcto cualquier equipo que vaya a estar conectado a este producto.
- Si es posible, utilice una sola mano cuando conecte o desconecte los cables de sent.al.
- No encienda nunca un equipo cuando haya riesgos de incendio, de inundaciín o de daños estructurales.
- Desconecte los cables de alimentaciín, sistemas de telecomunicaciones, redes y mídems conectados antes de abrir las cubiertas del dispositivo a menos que se indique lo contrario en los procedimientos de instalaciín y configuraciín.
- Conecte y desconecte los cables tal como se describe en la tabla siguiente cuando desee realizar una operaciín de instalaciín, de traslado o de apertura de las cubiertas para este producto o para los dispositivos conectados.

Para la conexin	Para la desconexiín
1. APÁGUELO todo. 2. En primer lugar, conecte los cables a los dispositivos. 3. Conecte los cables de señal a los conectores. 4. Conecte cada cable de alimentaciín a la toma de alimentaciín. 5. ENCIENDA el dispositivo.	1. APÁGUELO todo. 2. En primer lugar, retire cada cable de alimentaciín de la toma de alimentaciín. 3. Retire los cables de señal de los conectores. 4. Retire los cables de los dispositivos.

- Declaración 2

PRECAUCIÓN:

Cuando desee sustituir la batería de litio, utilice únicamente el número de pieza 33F8354 de IBM o cualquier tipo de batería equivalente que recomiende el fabricante. Si el sistema tiene un mídulo que contiene una batería de litio, sustitúyalo únicamente por el mismo tipo de mídulo, que ha de estar creado por el mismo fabricante. La batería contiene litio y puede explotar si el usuario no la utiliza ni la maneja de forma adecuada o si no se desprende de la misma como corresponde.

No realice las acciones siguientes:

- Arrojarla al agua o sumergirla
- Calentarla a una temperatura que supere los 100°C (212°F)
- Repararla o desmontarla

Despréndase de la batería siguiendo los requisitos que exija el reglamento o la legislaciín local.

- Declaración 3

PRECAUCIÓN:

Cuando instale productos láser (como, por ejemplo, CD-ROM, unidades DVD, dispositivos de fibra íptica o transmisores), tenga en cuenta las advertencias siguientes:

- No retire las cubiertas. Si retira las cubiertas del producto láser, puede quedar expuesto a radiaciín láser perjudicial. Dentro del dispositivo no existe ninguna pieza que requiera mantenimiento.
- El uso de controles o ajustes o la realizaciín de procedimientos que no sean los que se han especificado aquí pueden dar como resultado una exposiciín perjudicial a las radiaciones.

PELIGRO

Algunos productos láser contienen un diodo de láser incorporado de Clase 3A o de Clase 3B. Tenga en cuenta la advertencia siguiente.

Cuando se abre, hay radiaciín láser. No mire fijamente el rayo ni lleve a cabo ningún examen directamente con instrumentos ípticos; evite la exposiciín directa al rayo.

- Declaración 4

≥18 kg ≥32 kg ≥55 kg

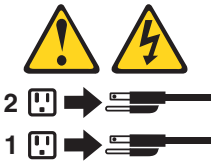
PRECAUCIÓN:

Tome medidas de seguridad al levantar el producto.

- Declaración 5

PRECAUCIÓN:

El botín de control de alimentaciín del dispositivo y el interruptor de alimentaciín de la fuente de alimentaciín no apagan la corriente eléctrica suministrada al dispositivo. Es posible también que el dispositivo tenga más de un cable de alimentaciín. Para eliminar la corriente eléctrica del dispositivo, asegúrese de desconectar todos los cables de alimentaciín de la fuente de alimentaciín.



- Declaración 10

PRECAUCIÓN:

No coloque ningún objeto que pese más de 82 kg (180 libras) encima de los dispositivos montados en bastidor.

Appendix C. Notices

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Important notes

Processor speeds indicate the internal clock speed of the microprocessor; other factors also affect application performance.

CD-ROM drive speeds list the variable read rate. Actual speeds vary and are often less than the maximum possible.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1 000 000 bytes, and GB stands for approximately 1 000 000 000 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity may vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives available from IBM.

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Some software may differ from its retail version (if available), and may not include user manuals or all program functionality.

Product recycling and disposal

This unit contains materials such as circuit boards, cables, electromagnetic compatibility gaskets, and connectors which may contain lead and copper/beryllium alloys that require special handling and disposal at end of life. Before this unit is disposed of, these materials must be removed and recycled or discarded according to applicable regulations. IBM offers product-return programs in several countries. For country-specific instructions, refer to the following Web site: http://www.ibm.com/ibm/environment/products/prp.shtml.

This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries, contact your local waste disposal facility.

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Electronic emission notices

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio

communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits.IBM is not responsible for any radio or television interference causedby using other than recommended cables and connectors or by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Australia and New Zealand Class A statement

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

United Kingdom telecommunications safety requirement

Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Taiwanese Class A warning statement

警告使用者:
這是甲類的資訊產品，在
居住的環境中使用時，可
能會造成射頻干擾，在這
種情況下，使用者會被要
求採取某些適當的對策。

Chinese Class A warning statement

声　　明
此为 A 级产品。在生活环境中，
该产品可能会造成无线电干扰。
在这种情况下，可能需要用户对其
干扰采取切实可行的措施。

Japanese Voluntary Control Council for Interference (VCCI) statement

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Part Number: 24P2965

(1P) P/N: 24P2965